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DENVER, COLORADO

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****** CORRECTION NOTICE ******

Trav-Ler Models 517-106, 517-107, 521-111 and 521-112 (Ch. 520A5) were covered in Photofact Folder 10 - Set 338.

The alignment instructions given on page 6 of Photofact Folder 10 - Set 338 are in error.

The correct alignment instructions are given in the following chart.

TRAV-LER MODELS 517-106, 517-111, 521-112 (Ch. 520A5)

PRODUCTION CHANGES
BULLETIN 180

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage lead should be securely taped and kept away from the chassis. Do not remove the horizontal oscillator tube (V9) to disable the high voltage.
Use an isolation transformer to protect the test equipment.

VIDEO IF ALIGNMENT

Connect the negative lead of a 3 volt battery to the ungrounded side of C26. Connect the positive lead to chassis. Remove the converter tube (V2) from its socket and replace with a 5J6 which has pin 1 removed. This will disable the local oscillator and reduce the possibility of erroneous indications.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Direct	High side to an ungrounded tube shield floating over converter tube. Low side to chassis.	24MC (10MC Swp)	21.75MC 26.25MC	Any	Vert. Amp. thru 10K to point Ⓐ. Low side to chassis.	A1, A2, A3, A4, A5, A6	If necessary, reduce bias to 1.5 volts to obtain usable pattern on scope. Adjust A1 thru A6 to obtain response similar to Fig. 1. A1 and A2 affect the audio side of the response curve. A3 and A4 will affect the video side. Adjust A5 and A6 for proper symmetry, flatness and bandwidth.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
2.	Direct	High side to point Ⓐ. Low side to chassis.	4.5MC (Unmod)	Any	DC probe to point Ⓑ. Common to chassis.	A7, A8	Adjust for maximum deflection.
3.	"	"	"	"	DC probe to point Ⓒ. Common to chassis.	A9	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

(Con't. on reverse side)

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ALIGNMENT INSTRUCTIONS (cont)

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

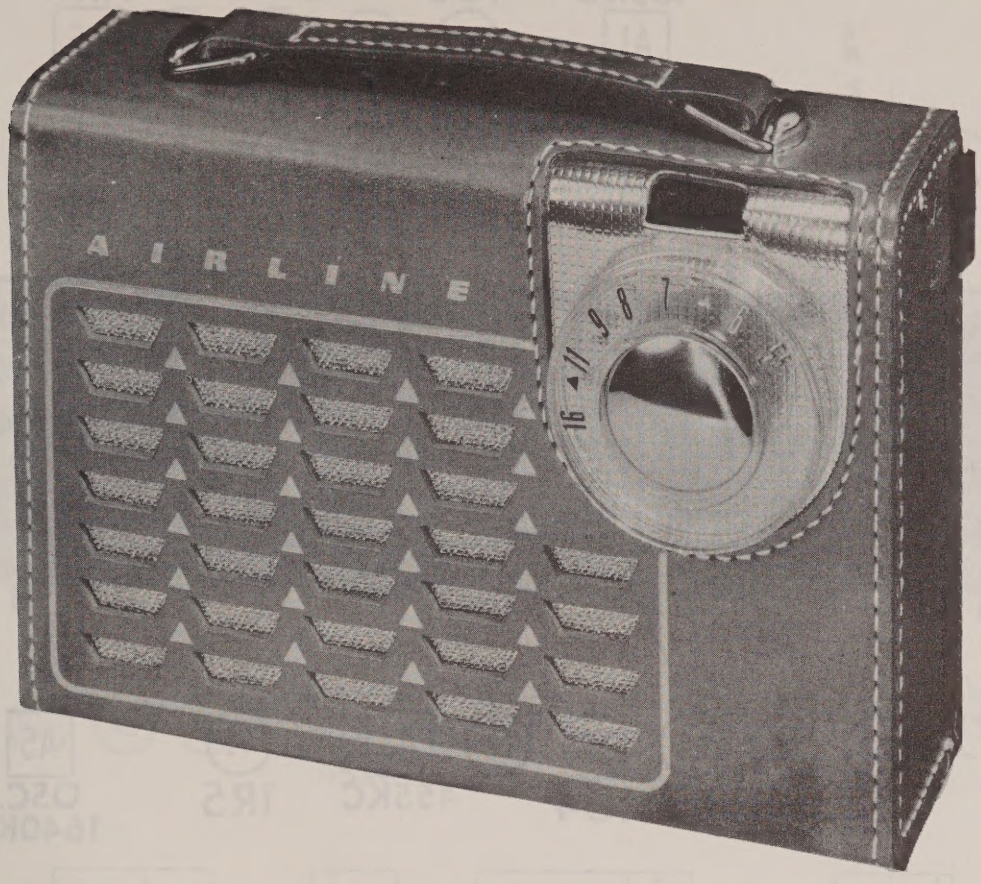
Use frequency modulated signal with 60~ modulation and 450KC sweep. Use 120~ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
2.	Direct	High side to point Ⓐ. Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any	Vert. Amp. to point Ⓑ. Low side to chassis.	A7, A8	Disconnect stabilizing capacitor C2. Adjust for a curve of maximum amplitude and symmetry as in Fig. 2.
3.	"	"	"	"	"	Vert. Amp. to point Ⓒ. Low side to chassis.	A9	Reconnect C2. Adjust so as to place 4.5MC marker at center of crossover lines as in Fig. 3. SLIGHTLY retouch A8 for maximum amplitude and straightness of crossover lines.

OSCILLATOR ALIGNMENT

Remove the dummy converter tube and replace the original 5J6 in its socket. The channel oscillator adjustment screws are reached thru a hole just to the left and below the channel switch shaft. The correct adjustment screw is accessible thru this hole as the channel switch is turned to each channel.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
4.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	213MC (10MC Swp)	211.25MC 215.75MC	13	Vert. Amp. thru 47K to point Ⓐ. Low side to chassis.	A10	Adjust to place sound marker in trap notch as in Fig. 4. Video marker should fall at 50%.
			207MC (10MC Swp)	205.25MC 209.75MC	12		A11	
			201MC (10MC Swp)	199.25MC 203.75MC	11		A12	
			195MC (10MC Swp)	193.25MC 197.75MC	10		A13	
			189MC (10MC Swp)	187.25MC 191.75MC	9		A14	
			183MC (10MC Swp)	181.25MC 185.75MC	8		A15	
			177MC (10MC Swp)	175.25MC 179.75MC	7		A16	
			85MC (10MC Swp)	83.25MC 87.75MC	6		A17	
			79MC (10MC Swp)	77.25MC 81.75MC	5		A18	
			69MC (10MC Swp)	67.25MC 71.75MC	4		A19	
			63MC (10MC Swp)	61.25MC 65.75MC	3		A20	
			57MC (10MC Swp)	55.25MC 59.75MC	2		A21	



AIRLINE
MODEL GEN-1103A

AIRLINE
MODEL GEN-1103A

TRADE NAME	Airline Model GEN-1103A
SUPPLIER	Montgomery Ward & Co., 619 Chicago Ave., Chicago, Ill.
TYPE SET	Three Power Portable AM Receiver
TUBES (Four)	Types 1R5 Converter, 1U4 IF Amplifier, 1U5 Det-AVC-AF Amp., 3V4 Output
POWER SUPPLY	110-120 Volts AC-DC (or) 7.5 Volts "A" Supply & 67.5 Volts "B" Supply
RATING	.17 Amp. @ 117 Volts AC (or) 52MA @ 7.5 Volts DC & 10MA @ 67.5 Volts DC
TUNING RANGE—BROADCAST	535KC - 1620KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use battery power, if possible. If AC power is used, use an isolation transformer when available. If not, connect a .1MFD capacitor in series with low side of the signal generator and B-.
Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Loop should be maintained in same relative position to chassis as when receiver is in cabinet.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.05MFD	High side to pin 6 (grid) of 1R5 (V1). Low side to B-.	455KC (400~ Mod)	Tuning gang fully open.	Across voice coil.	A1, A2, A3, A4	Adjust for maximum output. If AC power is used without an isolation transformer, reduce dummy antenna to 200MMF to reduce hum modulation.
2.		Loop	1640KC	"	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		"	1400KC	Tune to 1400KC signal.	"	A6	"

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PARTS LIST AND DESCRIPTIONS

AIRLINE
MODEL GEN-1103A

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Converter	1R5	
V2	IF Amplifier	1U4	
V3	Det-AVC-AF Amp.	1U5	
V4	Output	3V4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	AIRLINE PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	■60	150	E3213					Q-110	R2328*
B	▲60	150							
C	▲175	20							

* Non catalog item.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	AIRLINE PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C2	.047	200		BPD-05	DF-503	CUB2S47		GEM-4147	2TM-S47	
C3	10000			BPD-01	D6-103	K082	GP-10000	DC511	5HK-S1	
C4	5		E3328	N750-S15	TCN-5	N011	TC7-5	NT-555	5TCUB-V5	
C5	3000			BPD-003	D6-302	K076	GP-3000	UC-523	5HK-D33	
C6	5000			BPD-005	DD-502	K080	GP-5000	DC525	5HK-D5	
C7	.1	200		P288N-1	DF-104	CUB2P1		GEM-201	2TM-P1	
C8	.047	200		BPD-05	DF-503	CUB4S47		GEM-4147	2TM-S47	
C9	.1	400		P488N-1	DF-104	CUB4P1		GEM-401	4TM-P1	
C10	.047	400		BPD-05	DF-503	CUB4S47		GEM-4147	4TM-S47	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	AIRLINE PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1	500K	½	E2515					Volume

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

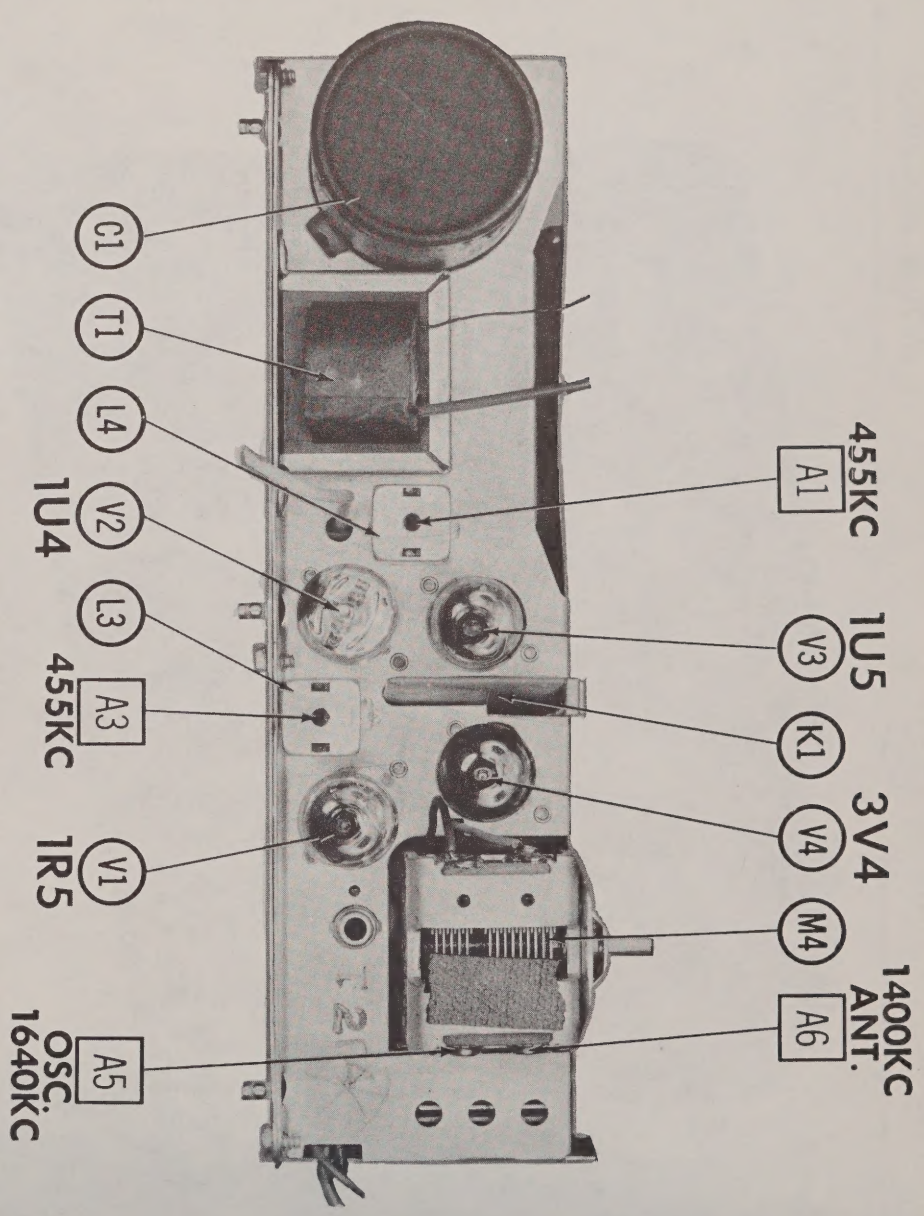
ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	AIRLINE PART No.	IRC PART No.	
R2	100K			BTS-100K	
R3	3.3Meg			BTS-3.3Meg	
R4	3.3Meg			BTS-3.3Meg	
R5	1000Ω			BTS-1000	
R6	1000Ω			BTS-1000	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	AIRLINE PART No.	IRC PART No.	
R7	1500Ω			BTS-1500	
R8	2500Ω	10		PW10-2500	
R9	6800Ω	2		BTB-6800	
R10	22Ω			BTS-22	

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	AIRLINE PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	10.2K	3-4Ω	E1111		A-2998		24S49	S-11X	

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	AIRLINE PART No.	QUAM PART No.	
SP1	4"	PM	3-4Ω	E1015	4A07	

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA				NOTES
		AIRLINE PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Loop Stick	E6013				
L2	Osc. Coil	E6124X			69-Osc.	
L3	Input IF	E6211	16-6800	BC-357	10-C1	
L4	Output IF	E6211	16-6801	BC-358	10-C2	

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	AIRLINE PART No.	REPLACEMENT DATA	
K1	Detector-Audio Net.	150MMF, 10000MMF, 2000MMF, 150MMF, 5000MMF, 10Meg, 3.3Meg, 4.7Meg, 1Meg	E-3325	Aerovox Centralab Sprague	PA521 PCT-165 DP-1

SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA						NOTES
	CURRENT	AIRLINE PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	
M1	.060A	E141	1386	RS065Q	6S65	8J1	65	

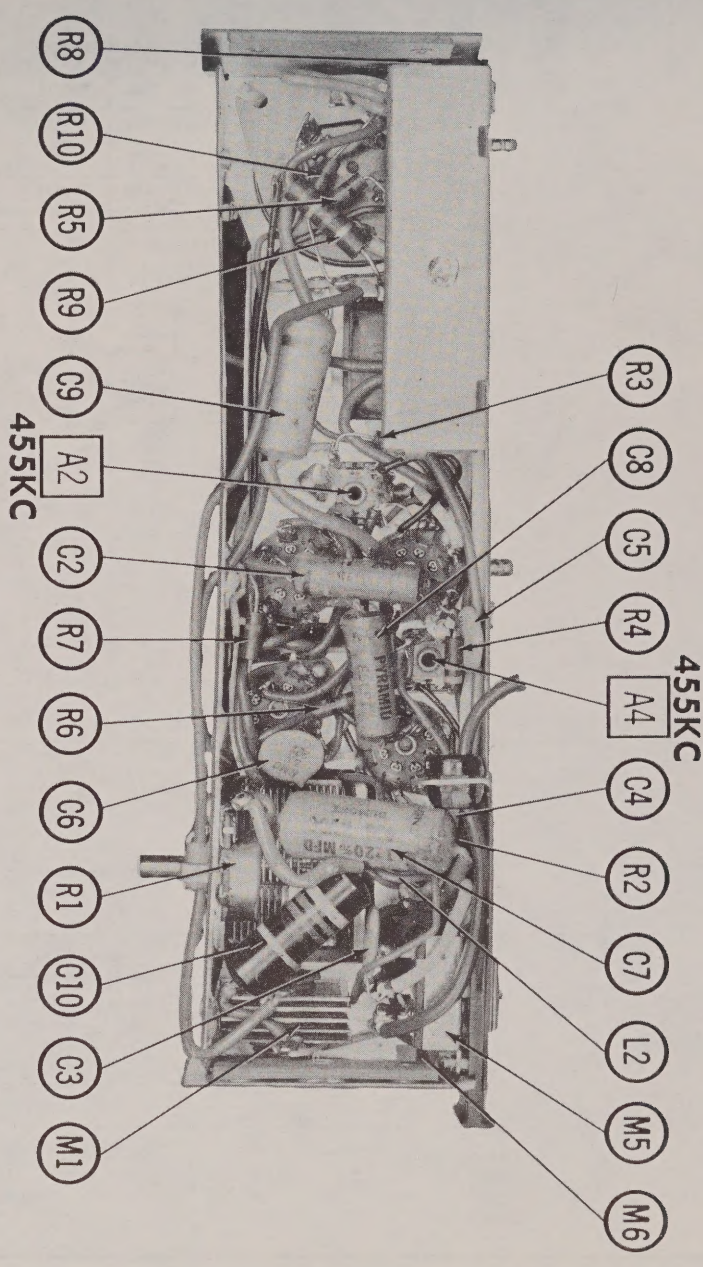
BATTERIES

ITEM No.	VOLTAGE	AIRLINE PART No.	REPLACEMENT DATA						INSTALLATION NOTES
			EVEREADY			BURGESS			
			"A"	"B"	"A-B"	"A"	"B"	"A-B"	
M2	7.5V "A"	29	717			65			
M3	67.5V "B"	40	477			P45			

MISCELLANEOUS

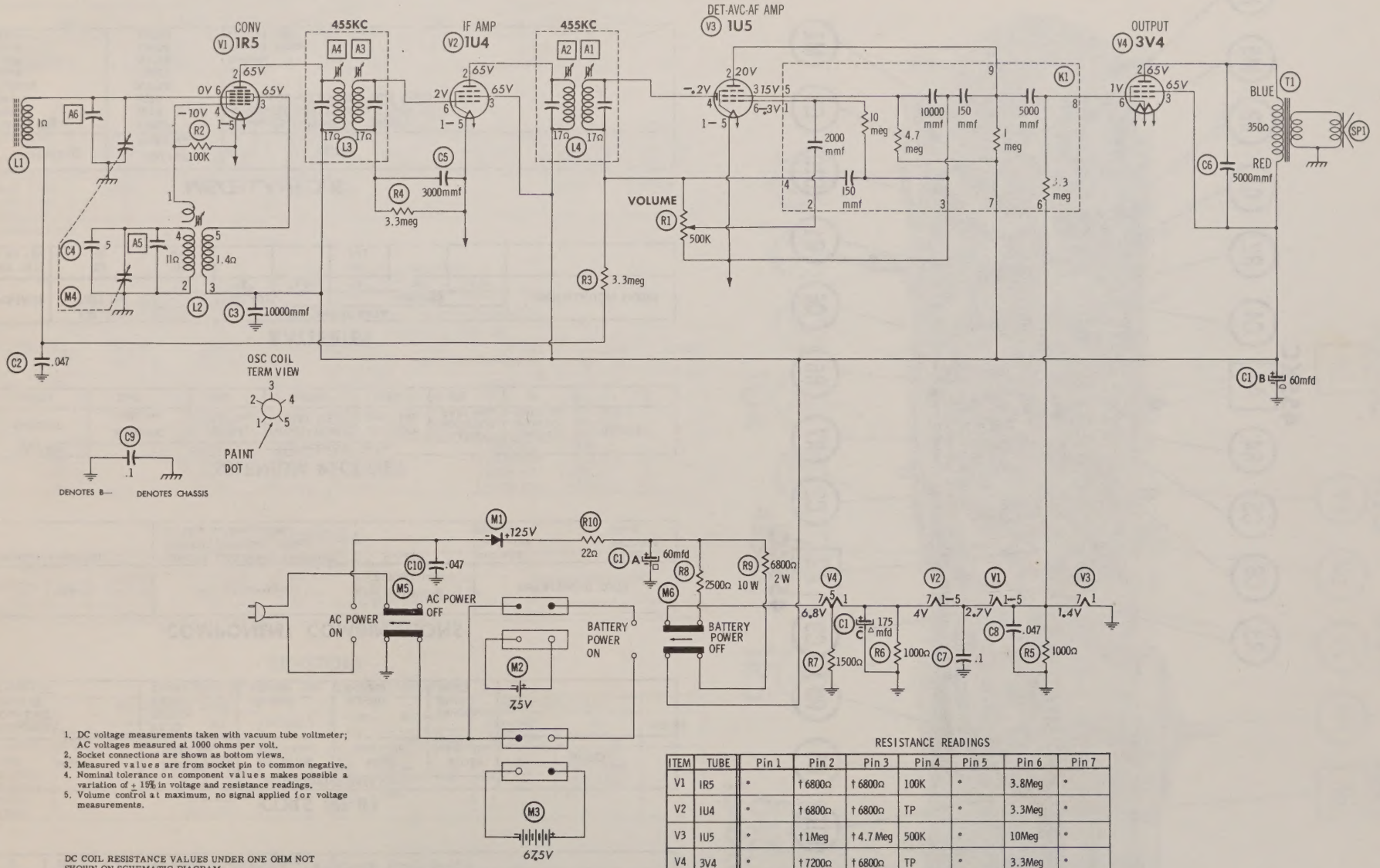
ITEM No.	PART NAME	AIRLINE PART No.	NOTES
M4	Tuning Cap.	E3516	2 Gang (15-240MMF, 11-115MMF)
M5	Switch	E128	AC On-Off (DPDT - Slide Type)
M6	Switch	E128	Battery On-Off (DPDT - Slide Type)
	Cabinet	E7026	
	Knob	E5037	Tuning
	Knob	E5036	Volume
	Knob	E5038	On-Off Black
	Knob	E5039	On-Off Red

CHASSIS—BOTTOM VIEW



AIRLINE MODEL GEN-1103A

AIRLINE MODEL GEN-1103A



1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
5. Volume control at maximum, no signal applied for voltage measurements.

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM.

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	1R5	*	†6800Ω	†6800Ω	100K	*	3.8Meg	*
V2	1U4	*	†6800Ω	†6800Ω	TP	*	3.3Meg	*
V3	1U5	*	†1Meg	†4.7Meg	500K	*	10Meg	*
V4	3V4	*	†7200Ω	†6800Ω	TP	*	3.3Meg	*

* DO NOT USE OHMMETER TO MEASURE FILAMENT RESISTANCE.
† MEASURED FROM OUTPUT OF M1.
TP TIE POINT.

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AUTOMATIC
MODEL TT600

AUTOMATIC
MODEL TT600

TRADE NAME	Automatic Model TT600
MANUFACTURER	Automatic Radio Mfg. Co., Inc., 122 Brookline Ave., Boston 15, Mass.
TYPE SET	Batter Operated Portable AM Superheterodyne Receiver With Transistorized Output
TUBES (Three)	Types 1V6 Converter, 1AH4 IF Amplifier, 1AJ5 Det. -AVC-AF Amp.
POWER SUPPLY	4 Volts "A" Supply & 45 Volts "B" Supply RATING 55MA @ 4 Volts DC & 3MA @ 45 Volts DC
TUNING RANGE—BROADCAST	540KC - 1610KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to pin 4 (grid) of 1AH4 (V2). Low side to chassis.	455KC (400~ mod.)	Tuning gang fully open.	Across voice coil.	A1, A2	Adjust for maximum output.
2.	"	High side to pin 3 (grid) of 1V6 (V1). Low side to chassis.	"	"	"	A3, A4	"
3.	"	"	1610KC	"	"	A5	"
4.		Loop	1400KC	Tune to 1400KC signal.	"	A6	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.

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PARTS LIST AND DESCRIPTIONS

TRANSISTORS

ITEM No.	USE	TYPE	NOTES
X1	Output	OC-71	Note 1
X2	Output	OC-71	Note 1

Note 1. Some versions may use type DR-128. X1 and X2 are a matched pair.

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Converter	1V6	
V2	IF Amplifier	1AH4	
V3	Det.-AVC-AF Amplifier	1AJ5	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA AUTOMATIC PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1	10	50	CE-528	SRE50V10	BBR10-50	TC32	ML-10-50	MMT-0510	TVA-1304
C2	40	6	CE-406-6	XPP6V40	EC40-6		ML-40-6		TE-1095

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA AUTOMATIC PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C3	15000		DCC153-5	BPD-015	DD16-153		821-015		5HK-S15	
C4	5		DCC5-5M	NP0-DI5	TCZ-4R7	Z011	NP0A-050	ZT-555	5TCCB-V47	Note 1
C5	2000		DCC-502-5M	BPD-002	DD-202	K072	801-002	DC-522	5HK-D2	
C6	5		DCC5-5M	NP0-DI5	TCZ-4R7	Z011	NP0A-050	ZT-555	5TCCB-V47	
C7	50			DI-00005	DD-500	G034	831-500	UC-545	5GA-Q5	Note 1
C8A	150		†PC-TT600							
B	1000									
C	10000									
D	100									
C9	2000			BPD-002	DD-202	K072	801-002	DC-522	5HK-D2	Note 1
C10	15000		DCC153-5	BPD-015	DD16-153		821-015		5HK-S15	Note 2
C11	50000		DCC503-5	BPD-05						

Note #1. Not used in some versions.
Note #2. Some versions may use .05MFD in this application (Part No. DCC503-5).
† Items C8A, C8B, C8C, C8D, R7A and R7B are combined in one unit.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA AUTOMATIC PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1	1Meg	½	RV-528					Volume & switch

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA AUTOMATIC PART No.	REPLACEMENT DATA IRC PART No.	NOTES
R2	4.7Meg		R475-1/3	BTR-4.7Meg	
R3	470K			BTR-470K	Note 1
R4	10Meg		R106-1/3	BTR-10Meg	
R5	4.7Meg		R475-1/3	BTR-4.7Meg	
R6	68K			BTR-68K	Note 2
R7A	6.8Meg		†PC-TT600	BTR-6.8Meg	
B	270K			BTR-270K	
R8	120Ω		R121-1/3S	BTR-120	
R9	2700Ω		R272-1/3S	BTR-2700	

† Items R7A, R7B, C8A, C8B, C8C, C8D are combined in one unit.
Note 1. Some versions use 1Meg in this application (Part #R105-1/3).
Note 2. Some versions use 100K in this application (Part #R104-1/3).

PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO (INPUT)

ITEM No.	Resistance PRI.	Resistance SEC.	REPLACEMENT DATA AUTOMATIC PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	3.25K	34.5Ω CT	T1-2104				TR-25		
	Turns Ratio								
	8½ : 1								

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA AUTOMATIC PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	435Ω	14.6Ω	TO-1401				TR-16		

SPEAKER

ITEM No.	RATINGS SIZE	RATINGS FIELD	RATINGS V. C. IMP.	REPLACEMENT DATA AUTOMATIC PART No.	QUAM PART No.		NOTES
SP1	2 3/4"	PM	14.6Ω	PM-528			

COILS (RF-IF)

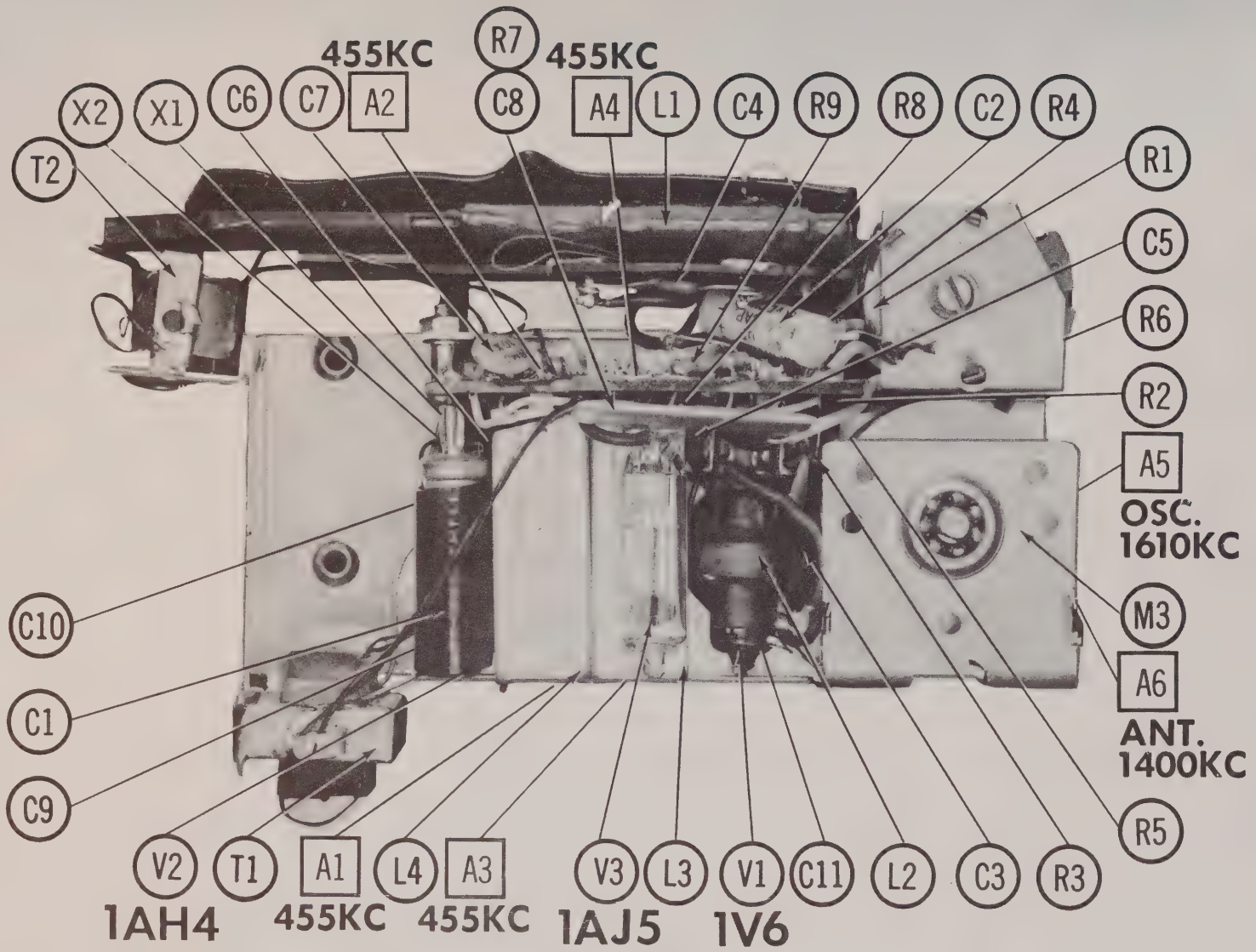
ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA AUTOMATIC PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	Loop Stick	2.9Ω		LA-528				
L2	Osc. Coil	2.3Ω	9.3Ω	L-528				
L3	Input IF	16Ω	16Ω	392PC	16-6800		10-C1	
L4	Output IF	19Ω	19Ω	385PC	16-6801		10-C2	

BATTERIES

ITEM No.	VOLTAGE	AUTOMATIC PART No.	REPLACEMENT DATA EVEREADY "A"	EVEREADY "B"	EVEREADY "A-B"	BURGESS "A"	BURGESS "B"	BURGESS "A-B"	INSTALLATION NOTES
M1	4V "A"	4-D-137	E233						
M2	45V "B"	4-D-134		415			U30		

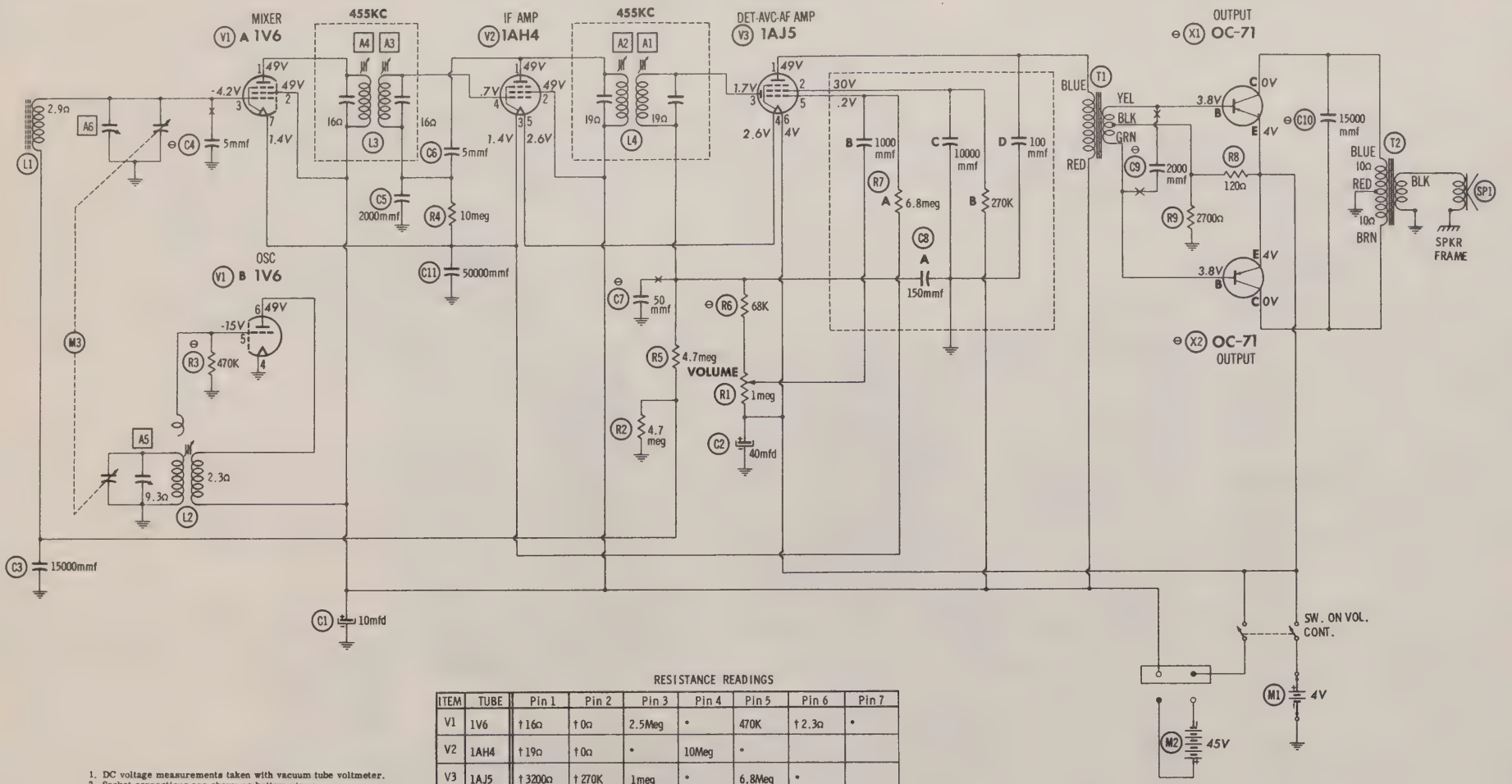
MISCELLANEOUS

ITEM No.	PART NAME	AUTOMATIC PART No.	NOTES
M3	Tuning Cap.	CV528A-1	2 Gang (15-265MMF, 8-85MMF)
	Case	H600-1	Less cover and handle (specify color)
	Cover	H528-2	Case (specify color)
	Handle	H528-3	Handle (specify color)
	Knob	H530	On-off-volume
	Knob	H529	Tuning



CHASSIS BOTTOM VIEW

AUTOMATIC
MODEL TT600



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	1V6	†16Ω	†0Ω	2.5Meg	•	470K	†2.3Ω	•
V2	1AH4	†19Ω	†0Ω	•	10Meg	•		
V3	1AJ5	†3200Ω	†270K	1meg	•	6.8Meg	•	
		BASE	EMITTER	COLLECTOR				
X1	OC-71	80Ω 150Ω	‡0Ω	10Ω				
X2	OC-71	80Ω 150Ω	‡0Ω	10Ω				

1. DC voltage measurements taken with vacuum tube voltmeter.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
5. Volume control at maximum, no signal applied for voltage measurements.

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM.

• DO NOT USE OHMMETER TO MEASURE FILAMENT RESISTANCE.
† MEASURED FROM POSITIVE SIDE OF C1.
‡ MEASURED FROM POSITIVE SIDE OF C2.
DUAL READING INDICATES REVERSAL OF METER LEADS.

⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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HALLICRAFTERS MODELS TW200, TW201, TW202, TW203 (Mark 1, A)

PROPERTY OF
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3924

HALLICRAFTERS MODELS TW200, TW201, TW202, TW203 (Mark 1, A)

HALLICRAFTERS MODELS TW200, TW201, TW202, TW203 (Mark 1, A)

TRADE NAME	Hallicrafters Models TW-200, TW-201, TW-202, TW-203 (Mark 1, A)
MANUFACTURER	Hallicrafters Co., 4401 W. 5th. Ave., Chicago 24, Ill.
TYPE SET	Three Power Portable AM Receiver
TUBES (Four)	Types 1R5 Converter, 1U4 IF Amplifier, 1U5 Det.-AVC-AF Amp., 3V4 Output
POWER SUPPLY	110-120 Volts AC-DC (or) 7.5 Volts "A" Supply & 67.5 Volts "B" Supply
RATINC	.17 Amp. @ 117 Volts AC (or) 50MA @ 7.5 Volts DC & 10.5MA @ 67.5 Volts DC
TUNING RANGE—BROADCAST	535KC-1620KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use battery power, if possible. If AC power is used, use an isolation transformer when available. If not, connect a .1MFD capacitor in series with low side of the signal generator and B-.
Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading.
Loop should be maintained in same relative position to chassis as when receiver is in cabinet.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.05MFD	High side to pin 6 (grid) of 1R5 (V1). Low side to B-.	455KC (400∿Mod)	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output. If AC power is used without an isolation transformer, reduce dummy antenna to 200MMF to reduce hum modulation.
2.		Loop	1640KC	"	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		"	1500KC	Tune to 1500KC signal	"	A6	"

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PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Converter	1R5	
V2	IF Amplifier	1U4	
V3	Det. -AVC-AF Amp.	1U5	
V4	Output	3V4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA Hallicrafters PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	60	150	121-1184	AFH4-98-50		FP311.15		Q-180	R2328 *
B	60	150							
C	175	20							

* Non-catalog item.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA Hallicrafters PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C2	.047	200	46AU503H	BPD-05	DF-503	CUB4S47		GEM-4147	2TM-S47	
C3	5		121-1205	N750-S1 5	TCN-5	N011	TC7-5	NT-555	5TCUB-V5	Note 1
C4	10000		47A224	BPD-01	DD-103	K082	ED-01	DC511	5HK-S1	
C5	3000		47A584	BPD-0033	D6-302	K076	GP-3000	UC-523	5GA-D3	
C6	5000		47B523	DI-005	DD-502	K080	GP-5000	DC525	5GA-D5	
C7	.047	200	46AU503H	BPD-05	DF-503	CUB4S47		GEM-4147	2TM-S47	
C8	.1	200	46AU104H	P288N-1	DF-104	CUB4P1		GEM-201	2TM-P1	
C9	.047	400	46BR473L4	BPD-05	DF-503	CUB4S47		GEM-4147	2TM-S47	
C10	.1	400	46AV104H	P488N-1	DF-104	CUB4P1		GEM-401	4TM-P1	

Note 1. Used only in Mark 1A chassis.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA Hallicrafters PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1	500K	1/2	121-1183					Volume

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

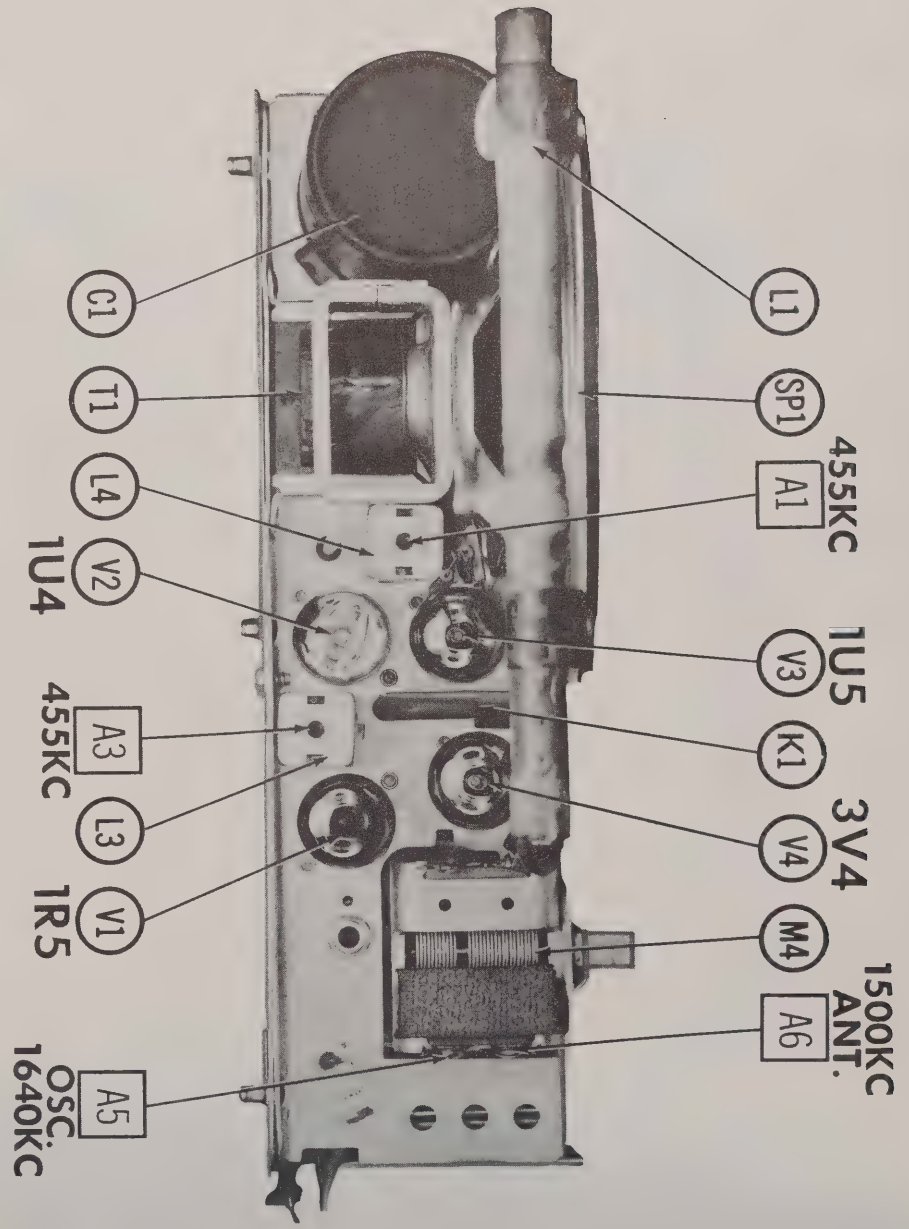
ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA Hallicrafters PART No.	REPLACEMENT DATA IRC PART No.	NOTES
R2	100K			BTS-100K	
R3	3.3Meg		23X20X335M	BTS-3.3Meg	
R4	3.3Meg		23X20X335M	BTS-3.3Meg	
R5	1000Ω		23X20X102M	BTS-1000	
R6	1000Ω		23X20X102M	BTS-1000	

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA Hallicrafters PART No.	REPLACEMENT DATA IRC PART No.	NOTES
R7	1500Ω		23X20X152M	BTS-1500	
R8	2500Ω	10	240K252E	PW10-2500	
R9	6800Ω	1	23X30X682K	BTA-6800	
R10	22Ω		23X20X220M	BTS-22	

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA Hallicrafters PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	10.2K	3-4Ω	121-1187		A-2998		24S49	S-11X	

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	Hallicrafters PART No.	QUAM PART No.	
SP1	4"	PM	3-4Ω	121-1197	4A07	

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA				NOTES
		Hallicrafters PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Loop Stick	121-1188				
L2	Osc. Coil	121-1204			69-OSC	Note 1
L3	Input IF	121-1186	16-6800	BC-358	10-C1	
L4	Output IF	121-1186	16-6801	BC-359	10-C2	

Note 1. Part #121-1189 used in chassis stamped Mark 1.

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	Hallicrafters PART No.	REPLACEMENT DATA	
K1	Detector-Audio Net	10Meg, 4.7Meg, 1Meg, 3.3Meg, 2000MMF, 150MMF, 10000MMF, 150MMF, 5000MMF	49-026	Aerovox Centralab Sprague	PA521 PC-165 DP-1

SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA						NOTES
	CURRENT	Hallicrafters PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	
M1	.060A	121-1198	1386	RS0652	6S65	8J1	65	

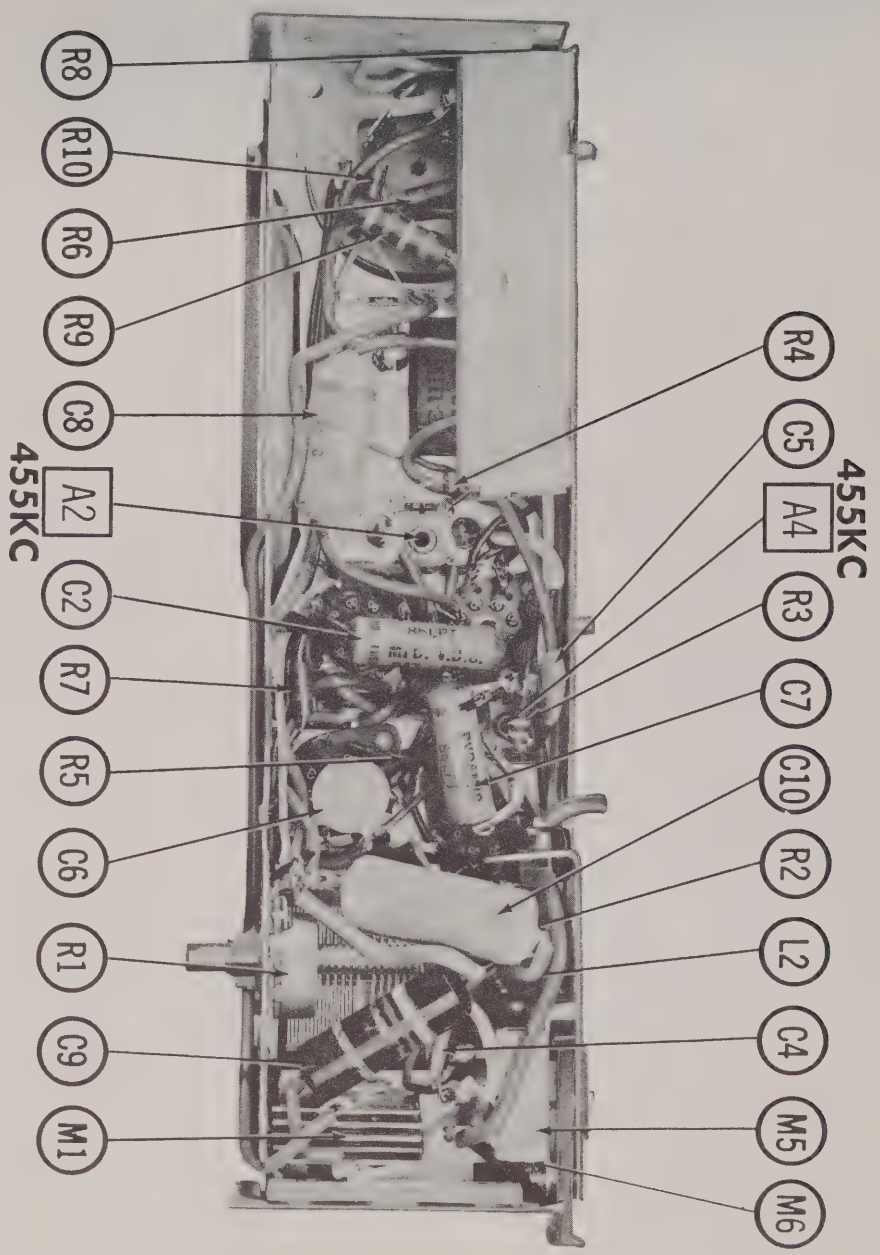
BATTERIES

ITEM No.	VOLTAGE	Hallicrafters PART No.	REPLACEMENT DATA						INSTALLATION NOTES
			EVEREADY			BURGESS			
			"A"	"B"	"A-B"	"A"	"B"	"A-B"	
M2 M3	7.5V "A" 67.5V "B"		717	477		C5	P45		

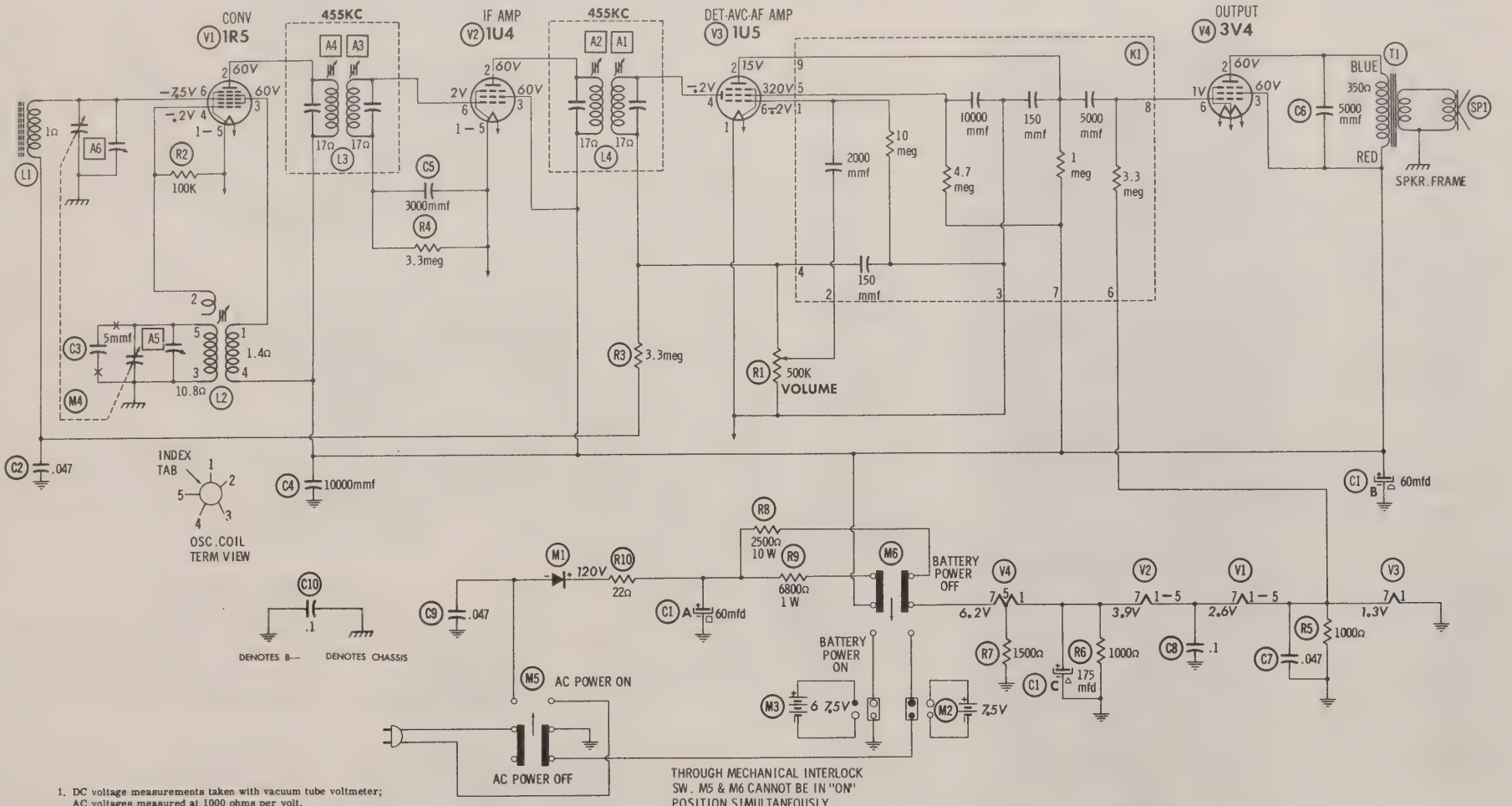
MISCELLANEOUS

ITEM No.	PART NAME	Hallicrafters PART No.	NOTES
M4	Tuning Cap.	121-1185	2 Gang (14-250MMF, 14-115MMF)
M5	Switch	121-1200	AC - On-off (DPDT - Slide type)
M6	Switch	121-1200	Battery on-off (DPDT - Slide type)
	Cabinet	121-1190	Model TW-200 (British tan) Specify color
	Cabinet	121-1190	Model TW-201 (Dove Gray) Specify color
	Cabinet	121-1190	Model TW-202 (Forrest Green) Specify color
	Cabinet	121-1190	Model TW-203 (Cherry Red) Specify color
	Knob	121-1195	Tuning
	Knob	121-1191	Volume
	Knob	121-1192	On-off(Red)
	Knob	121-1193	On-off(Black)

CHASSIS—BOTTOM VIEW



HALLICRAFTERS
MODEL TW-200 (Mark 1, A)



1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
5. Volume control at maximum, no signal applied for voltage measurements.

⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM.

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	1R5	•	†6800Ω	†6800Ω	100K	•	3.8Meg	•
V2	1U4	•	†6800Ω	†6800Ω	TP	•	3.3Meg	•
V3	1U5	•	†1Meg	†4.7Meg	500K	•	10Meg	•
V4	3V4	•	†7200Ω	†6800Ω	TP	•	3.3Meg	•

• DO NOT USE OHMMETER TO MEASURE FILAMENT RESISTANCE.
TP TIE POINT
† MEASURED FROM OUTPUT OF M1.

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KNIGHT
MODEL 94SX703

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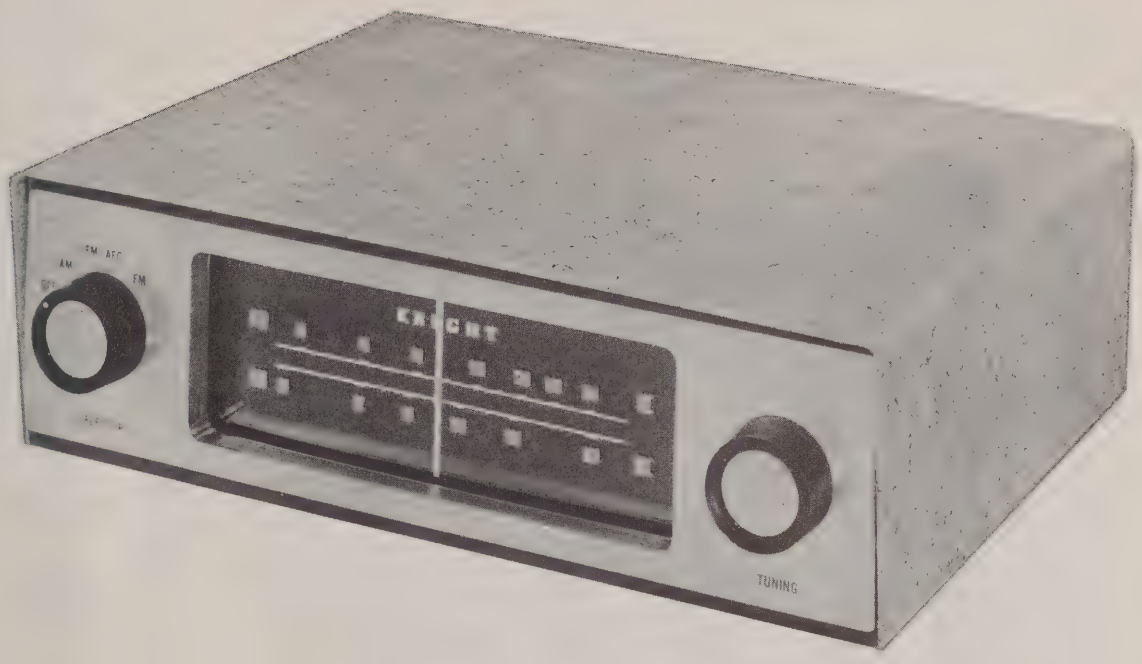
KNIGHT
MODEL 94SX703



KNIGHT
MODEL 94SX703

TRADE NAME	Knight Model 94SX703		
SUPPLIER	Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill.		
TYPE SET	AC Operated FM-AM Tuner		
TUBES (Eight)	Types 12AT7 FM RF Amp.-Mixer, 12AT7 FM Osc.-AFC, 6BE6 AM Converter, 6CB6 1st IF Amplifier, 6CB6 2nd FM IF Amp.-AM Det, 6AU6 Limiter, 6AL5 Discriminator, 6X4 Rectifier		
POWER SUPPLY	110-120 Volts AC - 50/60 Cycles	RATING	.38 Amp. @ 117 Volts AC
TUNING RANGE - BROADCAST	550KC - 1630KC	FM	88MC - 108MC

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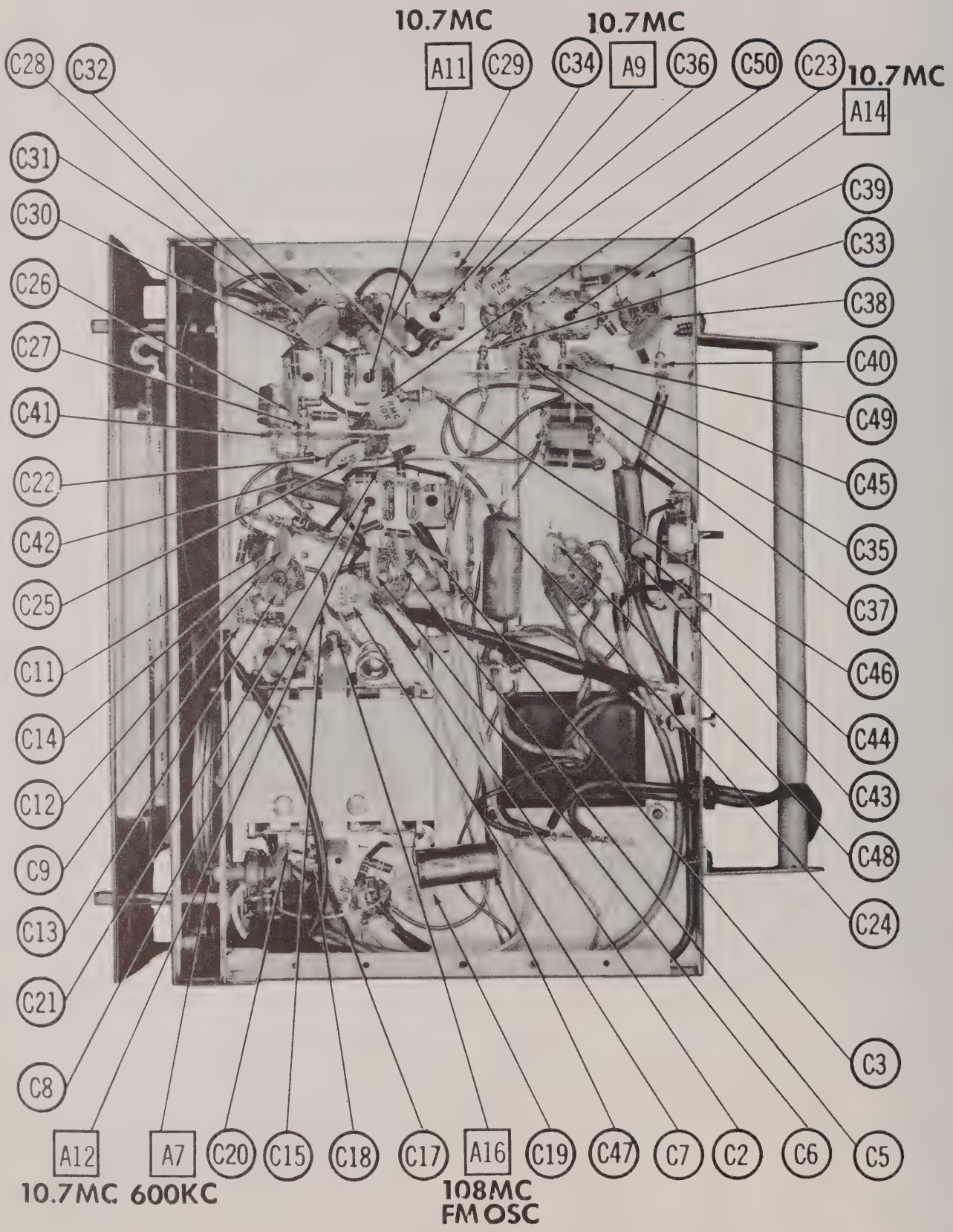

CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

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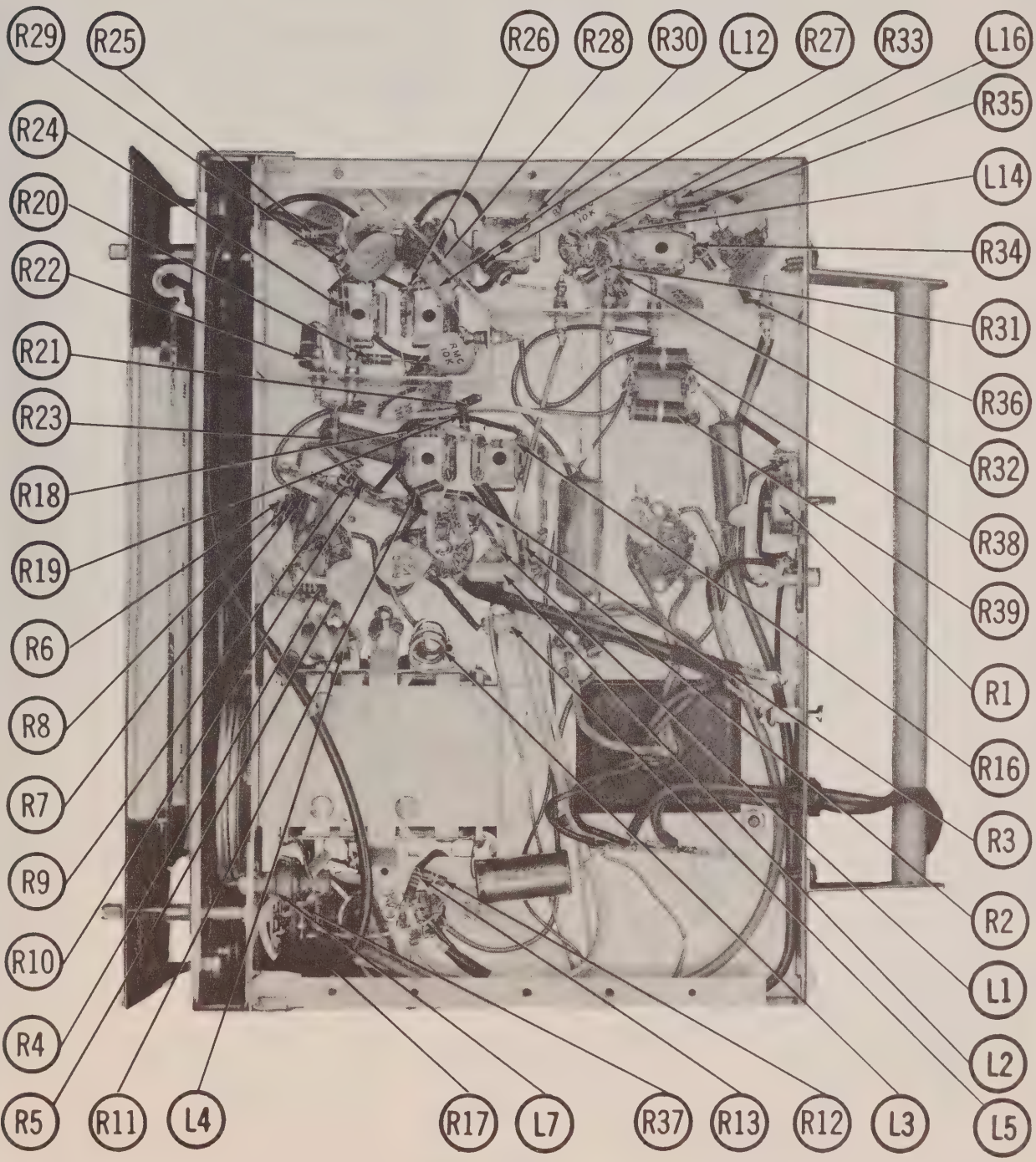
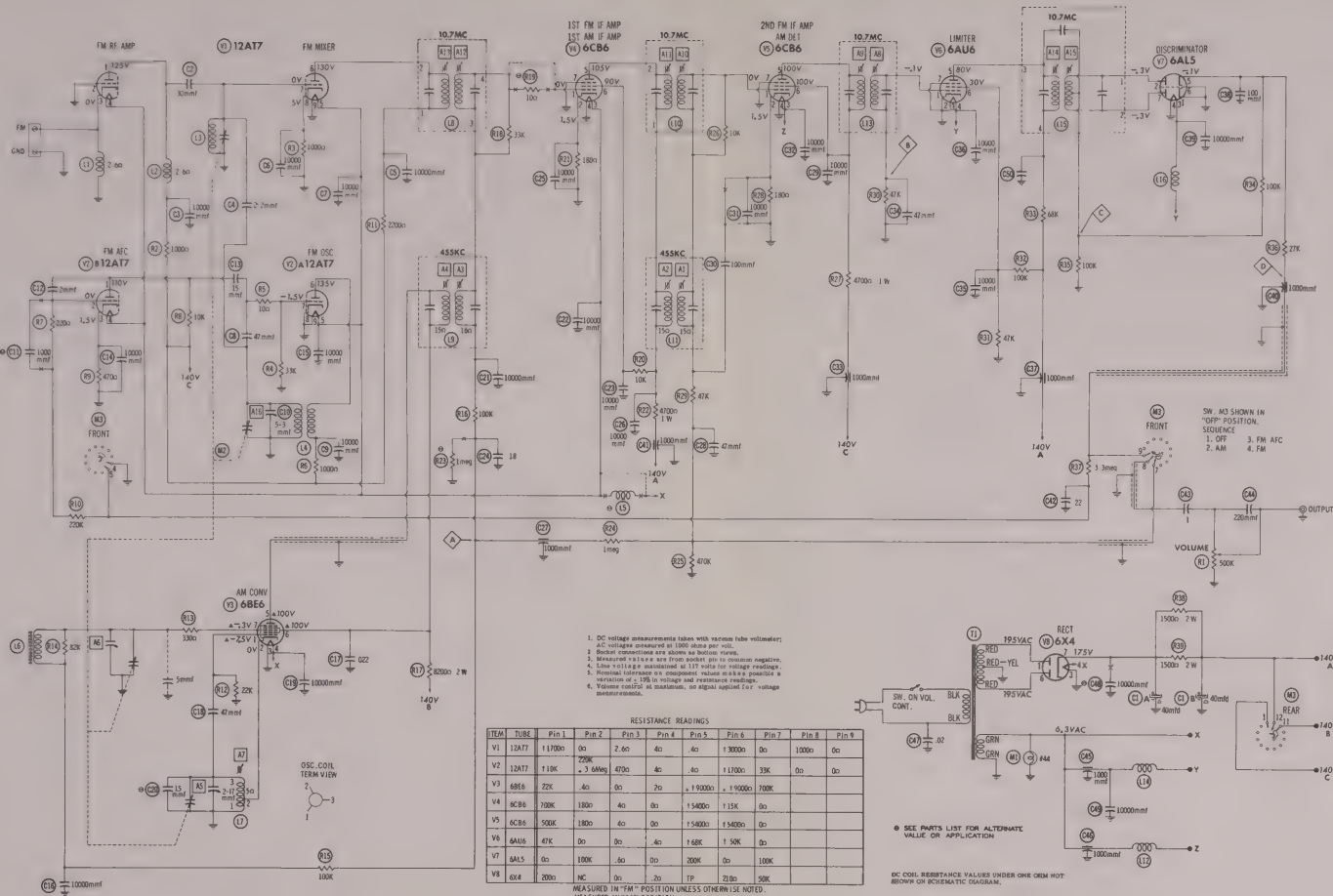


CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION



1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AT7	†17000	0Ω	2.6Ω	4Ω	.4Ω	†3000Ω	0Ω	1000Ω	0Ω
V2	12AT7	†10K	220K ▲ 3.6Meg	470Ω	4Ω	.4Ω	†1700Ω	33K	0Ω	0Ω
V3	6BE6	22K	.4Ω	0Ω	2Ω	▲ †90000Ω	▲ †9000Ω	700K		
V4	6CB6	700K	180Ω	4Ω	0Ω	†5400Ω	†15K	0Ω		
V5	6CB6	500K	180Ω	4Ω	0Ω	†5400Ω	†5400Ω	0Ω		
V6	6AU6	47K	0Ω	0Ω	.4Ω	†68K	† 50K	0Ω		
V7	6AL5	0Ω	100K	.6Ω	0Ω	200K	0Ω	100K		
V8	6X4	200Ω	NC	0Ω	2Ω	TP	220Ω	50K		

MEASURED IN "FM" POSITION UNLESS OTHERWISE NOTED.
▲ MEASURED IN "AM" POSITION.
● MEASURED IN "FM-AFC" POSITION.
† MEASURED FROM PIN 7 OF V8.

⊕ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM.

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ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading.
Use an insulated alignment screwdriver for adjusting.
To set pointer, turn tuning capacitor fully closed and set pointer parallel with base of dial.

AM ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1.	.01MFD	High side to pin 7 (grid) of 6BE6 (V3). Low side to chassis.	455KC (400~ Mod)	AM	Point of non-interference.	DC probe to point Ⓐ. Common to chassis.	A1, A2, A3, A4	Adjust for maximum deflection.
2.	270Ω carbon resistor	High side thru 270Ω to AM antenna stator lug on tuning gang. Low side to chassis.	1500KC	"	1500KC	"	A5, A6	"
3.	"	"	600KC	"	600KC	"	A7	"

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
4.	.01MFD	High side to pin 7 (grid) of 12AT7 (V1). Low side to chassis.	10.7MC (unmod)	FM	Point of non-interference.	DC probe to point Ⓑ. Common to chassis.	A8, A9, A10, A11, A12, A13	Adjust for maximum deflection.
5.	"	"	"	"	"	DC probe to point Ⓒ. Common to chassis.	A14	"
6.	"	"	"	"	"	DC probe to point Ⓓ. Common to chassis.	A15	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60~ modulation and 450KC sweep. Use 120~ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
4.	.01MFD	High side to pin 7 (grid) of 12AT7 (V1). Low side to chassis.	10.7MC (450KC Swp)	FM	Point of non-interference.	Vert. amp. to point Ⓑ. Low side to chassis.	A8, A9, A10, A11, A12, A13	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
5.	"	"	"	"	"	Vert. amp. to point Ⓒ. Low side to chassis.	A14	"
6.	"	"	"	"	"	Vert. amp. to point Ⓓ. Low side to chassis.	A15	Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A14 for maximum amplitude and straightness of crossover lines.

FM RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
7.	270Ω carbon resistor	High side thru 270Ω to FM antenna terminal. Low side to chassis.	108MC	FM	108MC	DC probe to point Ⓑ. Common to chassis.	A16	Adjust for maximum deflection.
8.	"	"	88MC	"	88MC	"	L3, L4	Adjust for maximum deflection by compressing or expanding coil turns.

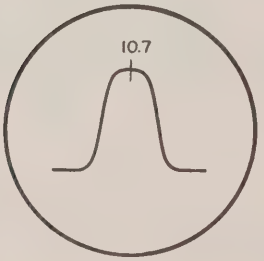


FIG. 1

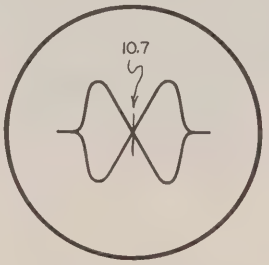
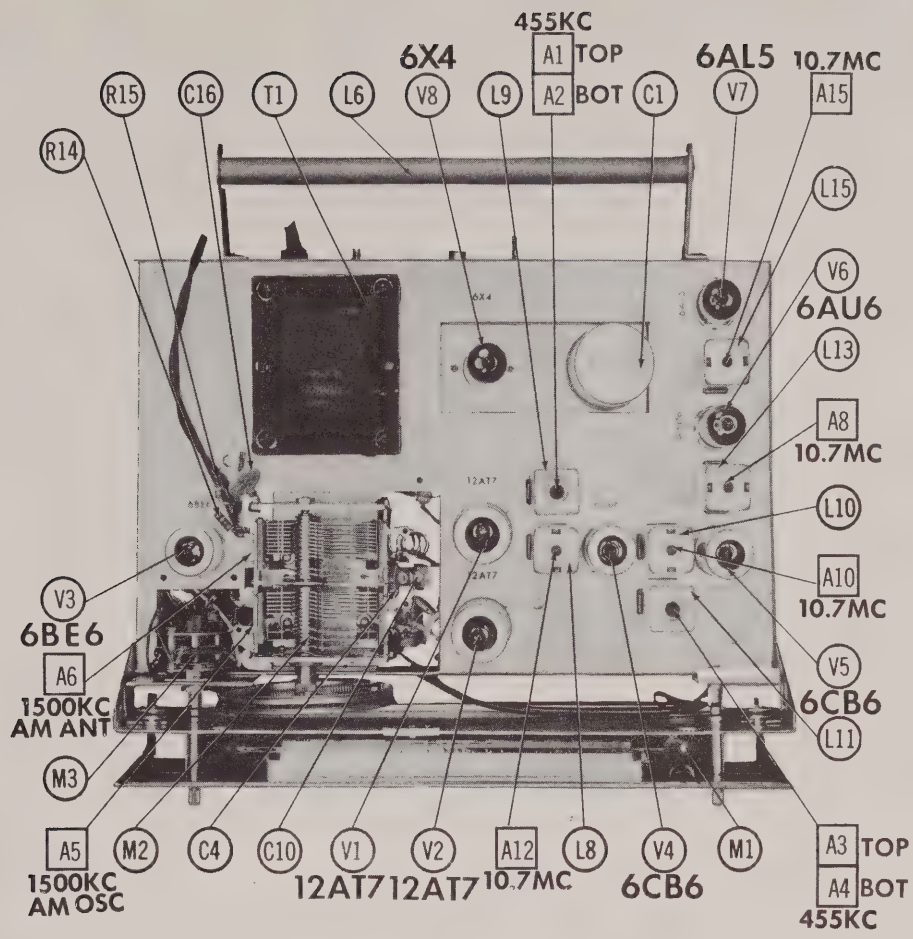
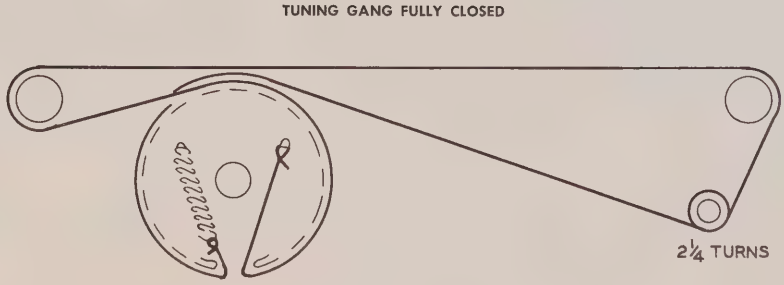


FIG. 2



CABINET—TOP VIEW



DIAL CORD STRINGING

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	FM RF Amp. -Mixer	12AT7	
V2	FM Oscillator-AFC	12AT7	
V3	AM Converter	6BE6	
V4	1st IF Amplifier	6CB6	
V5	2nd FM IF Amp. -AM Det.	6CB6	
V6	Limiter	6AU6	
V7	Discriminator	6AL5	
V8	Rectifier	6X4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	KNIGHT PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲40	300		AFH4-01-80	DO016	FP217. 87	TMQ-2		TVL-3577
B	▲40	300							

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	KNIGHT PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C2	30									
C3	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC511	5HK-S1	
C4	2. 2			NP0-S12. 2	TCZ-2R2	C10V22C	TCO-2. 2		5TCCB-V22	
C5	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC511	5HK-S1	
C6	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC511	5HK-S1	
C7	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC511	5HK-S1	
C8	47			NP0-SI47	TCZ-47	C10Q47C	TCO-47		5TCC-Q47	
C9	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC511	5HK-S1	
C10	. 5-3				829-3		3115-D	CT565A		
C11	1000			BPD-001	DD-102	BYA6D1	ED-1000	DC521	5HK-D1	Note 1
C12	2			NP0-SI2	TCZ-2R2	C10V2C	TCO-2			
C13	15			NP0-SI 15	TCZ-15	C10Q15C	TCO-15		5TCC-Q15	
C14	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC511	5HK-S1	
C15	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC511	5HK-S1	
C16	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC511	5HK-S1	
C17	. 022	200		BPD-02	DD-203	CUB2S22		GEM-2122	2TM-S22	
C18	47			NP0-SI47	TCZ-47	C10Q47C	TCO-47		5TCC-Q47	
C19	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC511	5HK-S1	
C20	15			NP0-SI15	TCZ-15	C10Q15C	TCO-15		5TCC-Q15	Note 2
C21	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC511	5HK-S1	
C22	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC511	5HK-S1	
C23	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC511	5HK-S1	
C24	. 18	200								
C25	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC511	5HK-S1	
C26	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC511	5HK-S1	
C27	1000			EF-001	MFT-1000				503C-D1	
C28	47			NP0-SI47	TCZ-47	C10Q47C	TCO-47		5TCC-Q47	
C29	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC511	5HK-S1	
C30	100			NP0-SI 100	TCZ-100	C10T1C	TCO-100	ZT-531	5TCC-T1	
C31	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC511	5HK-S1	
C32	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC511	5HK-S1	
C33	1000			EF-001	MFT-1000				503C-D1	
C34	47			NP0-SI47	TCZ-47	C10Q47C	TCO-47		5TCC-Q47	
C35	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC511	5HK-S1	
C36	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC511	5HK-S1	
C37	1000			EF-001	MFT-1000				503C-D1	
C38	100			NP0-SI100	TCZ-100	C10T1C	TCO-100	ZT-531	5TCC-T1	
C39	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC511	5HK-S1	
C40	1000			EF-001	MFT-1000				503C-D1	
C41	1000			EF-001	MFT-1000				503C-D1	
C42	.22	200		P288N-22		CUB2P22		GEM-2022	2TM-P22	
C43	. 1	200		P288N-1	DF-104	CUB2P1		GEM-201	2TM-P1	
C44	220			BPD-00022	DD-221	L10T22	ED-220	UC-5322	5GA-T22	
C45	1000			EF-001	MFT-1000				503C-D1	
C46	1000			EF-001	MFT-1000				503C-D1	
C47	. 02	600		BPD-02	DD-203	CUB6S2		GEM-612	6TM-S2	
C48	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC511	5HK-S1	Note 1
C49	10000			BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1	
C50	10000			BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1	

Note 1: Not used in some versions.
Note 2: Some versions may use 22MMF in this application.

PARTS LIST AND DESCRIPTIONS (Continued)

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESIST-ANCE	WATTS	KNIGHT PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	500K	½				B13-133	TA55A	Volume
B	Shaft					TM2-KIT	Not Req.	

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	KNIGHT PART No.	IRC PART No.	
R2	1000Ω			BTS-1000	
R3	1000Ω			BTS-1000	
R4	33K			BTS-33K	
R5	10Ω			BTS-10	
R6	1000Ω			BTS-1000	
R7	220Ω			BTS-220	
R8	10K			BTS-10K	
R9	470Ω			BTS-470	
R10	220K			BTS-220K	
R11	2200Ω			BTS-2200	
R12	22K			BTS-22K	
R13	330Ω			BTS-330	
R14	82K			BTS-82K	
R15	100K			BTS-100K	
R16	100K			BTS-100K	
R17	8200Ω	2		BTB-8200	
R18	33K			BTS-33K	
R19	10Ω			BTS-10	Note 1
R20	10K			BTS-10K	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	KNIGHT PART No.	IRC PART No.	
R21	180Ω			BTS-180	
R22	4700Ω	1		BTA-4700	
R23	1Meg			BTS-1Meg	Note 1
R24	1Meg			BTS-1Meg	
R25	470K			BTS-470K	
R26	10K			BTS-10K	
R27	4700Ω	1		BTA-4700	
R28	180Ω			BTS-180	
R29	47K			BTS-47K	
R30	47K			BTS-47K	
R31	47K			BTS-47K	
R32	100K			BTS-100K	
R33	68K			BTS-68K	
R34	100K 5%			BTS-100K 5%	
R35	100K 5%			BTS-100K 5%	
R36	27K			BTS-27K	
R37	3. 3Meg			BTS-3. 3Meg	
R38	1500Ω	2		BTB-1500	
R39	1500Ω	2		BTB-1500	

Note 1: Not used in some versions.

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	KNIGHT PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC @ .38A	355VCT @ .043A	6. 3VAC @ 2. 9A		LP-0245					

COILS (RF-IF)

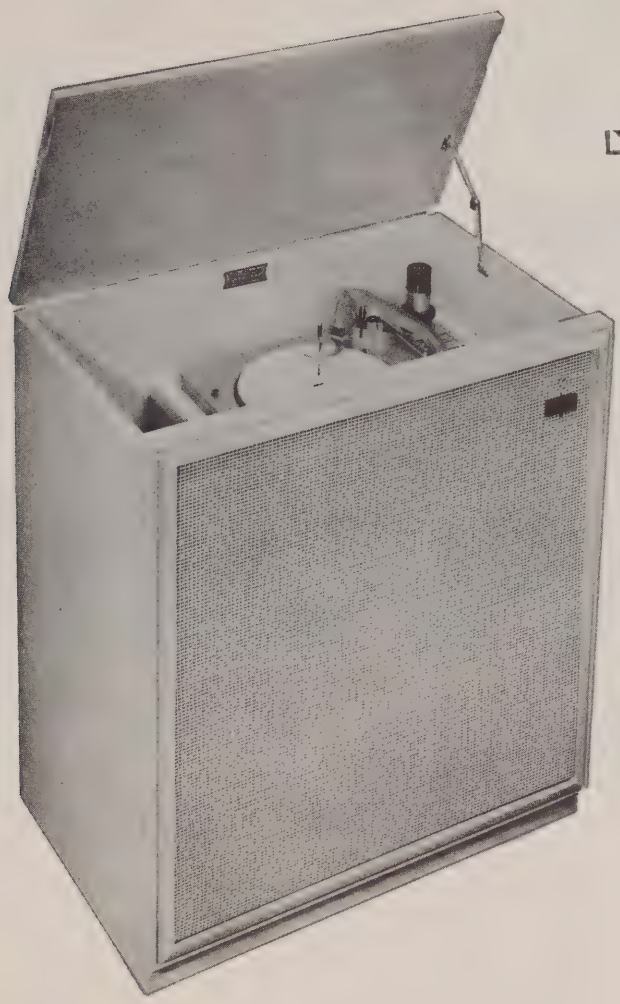
ITEM No.	USE	REPLACEMENT DATA				NOTES
		KNIGHT PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	RF Choke					3. 3 Microhenries; IRC part #CLA
L2	RF Choke					3. 3 Microhenries; IRC part #CLA
L3	FM RF Coil	LL-0054				
L4	FM Osc. Coil	LL-0055				
L5	Fil. Choke					. 68 Microhenries; IRC part #CLA
L6	AM Loop Stick	LW-0098				214 Microhenries
L7	AM Osc. Coil	LL-0049				120 Microhenries
L8	1st FM IF	LR-0033	16-3487	FM-254	1463	
L9	1st AM IF	LR-0041	16-6770	BC-355	12-C6	
L10	2nd FM IF	LR-0033	16-3487	FM-254	1463	
L11	2nd AM IF	LR-0041	16-6770	BC-355	12-C6	
L12	Fil. Choke					. 68 Microhenries; IRC part #CLA
L13	Limiter	LR-0033	16-3487	FM-254	1463	
L14	Fil. Choke					. 68 Microhenries; IRC part #CLA
L15	Discriminator	LQ-0179	17-3494	FM-253	1464	
L16	Fil. Choke					. 68 Microhenries; IRC part #CLA

MISCELLANEOUS

ITEM No.	PART NAME	KNIGHT PART No.	NOTES
M1	Dial Lamp	CV601	#44
M2	Tuning Cap.		4 Gang - AM Sections: 25-407MMF, 23-195MMF
M3	Switch		Function Selector, Wafer Type

MOTOROLA MODELS 67HFK1, 2, 3, 4, 67HFP1, 67HFT1 (Ch. HS-544)

MOTOROLA MODELS 67HFK1, 2, 3, 4, 67HFP1, 67HFT1 (Ch. HS-544)



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DENVER, COLORADO

MOTOROLA MODELS 67HFK1, 2, 3, 4, 67HFP1, 67HFT1 (Ch. HS-544)

TRADE NAME	Motorola Models 67HFK1, 2, 3, 4, 67HFP1, 67HFT1 (Ch. HS-544)
MANUFACTURER	Motorola Inc., 4545 W. Augusta Blvd., Chicago 51, Ill.
TYPE SET	AC Operated Phono Amplifier With 4 Speed Automatic Record Changer
TUBES (Six)	Types 6AU6 1st AF Amplifier, 12AU7 2nd AF Amplifier, 12AU7 3rd AF Amp. -Phase Inv., (2) 6V6GT Output, 5Y3GT Rectifier
POWER SUPPLY	110-120 Volts AC - 60 Cycles RATING .62 Amp. @ 117 Volts AC

FOR SERVICE INFORMATION ON THE VM8RC RECORD CHANGER USED IN THE 67HFK SERIES - SEE SIMILAR V-M MODEL 1200 - PHOTOFACT SET 290 FOLDER 11 OR RECORD CHANGER MANUAL CM-7. MOTOROLA RECORD CHANGER W11RC USED IN MODELS 67HFP1, 67HFT1.

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	AF Amplifier	6AU6	
V2	AF Amplifier	12AU7	
V3	AF Amp. -Phase Inv.	12AU7	
V4	Output	6V6GT	
V5	Output	6V6GT	
V6	Rectifier	5Y3GT	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	MOTOROLA PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲40	400	23B632244	AFH4-79-10	CO344	FP430.6	TMQ-164	Q-390	TVL-4739
B	■40	400			BR502				
C	▲20	400							
D	40	25							
C2	5	10	23A632250 (Note 1)	PRS10VAC8	BBR10-25 † BBR10-25 †	TC22 † TC22 †		MMT-0210 † MMT-0210 †	R2316*

Note 1: Non polarized unit.
† Connect negative leads together.
* Non catalog item.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	MOTOROLA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C3	.01	400	8R121002	BPD-01	D6-103	CUB4S1		GEM-411	4TM-S1	
C4	100		21R400537	N750-S1 100	TCN-100	N042	TC7-100	NT-531	5TCU-T1	
C5	.01	400	8R121002	BPD-01	D6-103	CUB4S1		GEM-411	4TM-S1	
C6	.01	400	8R121002	BPD-01	D6-103	CUB4S1		GEM-411	4TM-S1	
C7	470		21K121797	DI-470	DD-471	K060	ED-470	UC-5347	5GA-T47	
C8	100		21R400537	N750-S1 100	TCN-100	N042	TC7-100	NT-531	5TCU-T1	
C9	.02	400	8R121566	BPD-02	DD-203	CUB4S2		GEM-412	4TM-S2	
C10	1000		21A121678	BPD-001	DD-102	K069	GP-1000	DC521	5HK-D1	
C11	10000		21R121946	BPD-01	DD-103	K082	ED-10000	DC511	5HK-S1	
C12	.02	400	8R121566	BPD-02	DD-203	CUB4S2		GEM-412	4TM-S2	
C13	.05	400	8R121567	BPD-05	DF-503	CUB4S5		GEM-415	4TM-S5	
C14	.05	400	8R121567	BPD-05	DF-503	CUB4S5		GEM-415	4TM-S5	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	MOTOROLA PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	1Meg	½	18B632246	C1-70				Loudness Tap @ 400K & 600K (Part No. includes K1)
B	Shaft			Not Req.				
R2A	2Meg	½	18B632245	B-76	A47-2Meg-Z	Q13-139	U55	Treble
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	
R3A	2Meg	½	18B632245	B-76	A47-2Meg-Z	Q13-139	U55	Bass
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	

RESISTORS

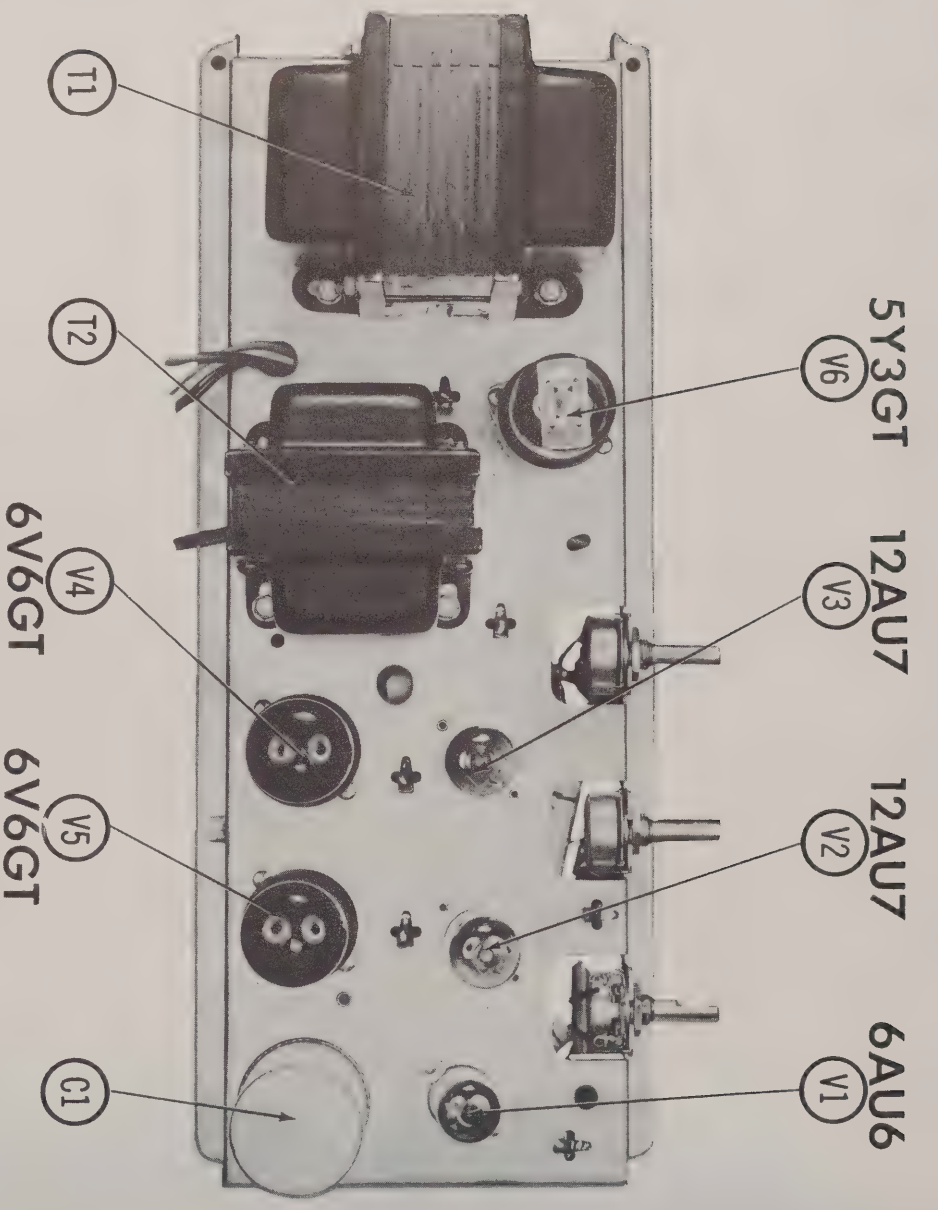
All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	MOTOROLA PART No.	IRC PART No.	
R4	3.3Meg		6R2118	BTS-3.3Meg	
R5	100K	1	6R6328	BTA-100K	
R6	330K	1	6R118215	BTA-330K	
R7	1000Ω	1	6R6327	BTA-1000	
R8	2.2Meg		6R6433	BTS-2.2Meg	
R9	220K		6R6407	BTS-220K	
R10	100K		6R6031	BTS-100K	
R11	3300Ω		6R5581	BTS-3300	
R12	470K		6R6377	BTS-470K	
R13	47K		6R6048	BTS-47K	
R14	100K		6R6031	BTS-100K	
R15	3300Ω		6R5581	BTS-3300	
R16	1200Ω	1	6R5770	BTA-1200	Note 1
R17	470K		6R6032	BTS-470K	
R18	100K	1	6R6328	BTA-100K	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	MOTOROLA PART No.	IRC PART No.	
R19	4700Ω		6R6080	BTS-4700	
R20	5600Ω		6R6117	BTS-5600	
R21	100K	1	6R6328	BTA-100K	
R22	2200Ω		6R6069	BTS-2200	
R23	220K		6R6407	BTS-220K	
R24	330K		6R2096	BTS-330K	
R25	220K		6R6407	BTS-220K	
R26	100Ω		6R6018	BTS-100	
R27	100Ω		6R6018	BTS-100	
R28	220Ω	5	17K632247	PW7-220	
R29	1200Ω	1	6R5770	BTA-1200	
R30	820K		6R6429	BTS-820K	
R31	27Ω		6R5683	BTS-27	
R32	27Ω		6R5683	BTS-27	
R33	150K		6R6182	BTS-150K	
R34	3.3Ω	1	6K490131		

Note 1: A 22K resistor (Part #6R6289) used in some versions.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	MOTOROLA PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC @ .62A	600VCT @ .093A	5VAC @ 2A	6.3VAC @ 2.1A	25C632257	P9312 ①			22R04 ②	

① Drill new mounting hole.
② Use Universal mounting brackets.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	MOTOROLA PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	5500Ω CT	6-8Ω	25C632258	Z1405 ①			22S97 ②		① Tape 10000Ω winding on primary; tape 4Ω, 16Ω & 500Ω taps on secondary. ② Tape 3.5Ω, 16Ω, 250Ω & 500Ω taps on secondary.

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	MOTOROLA PART No.	QUAM PART No.	
SP1	15"	PM	6-8Ω	50C632259 ①	15A10LF0	① Used in model 67HFK.
SP2	5 1/4"	PM	6-8Ω	50C634521 ①	52A1Z6.8	② Used in models 67HFP, 67HFT.
SP3	5 1/4"	PM	3-4Ω	50K634522 ①	52A1TZ3.6	③ 2 required.
SP4	5 1/4"	PM	3-4Ω	50K634523 ①	52A1TZ3.4	
	8"	PM	6-8Ω	50C636447 ②		
	4"	PM	6-8Ω	50C636446 ② ③		

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	MOTOROLA PART No.	REPLACEMENT DATA
K1	Loudness Comp. Net.	3000MMF, 3000MMF, 50MMF, 100MMF, 100K, 100K		Part of loudness control (R1)

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA				REMARKS
	MOTOROLA PART No.	ASTATIC PART No.		ELECTRO-VOICE PART No.	
		CARTRIDGE	NEEDLE	CARTRIDGE	MOUNT	
M1		55-T	GD	56	PT-2	

ASTATIC NEEDLE LISTING SHOWN ABOVE IS SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGE LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENT SEE BELOW.

PHONO NEEDLE

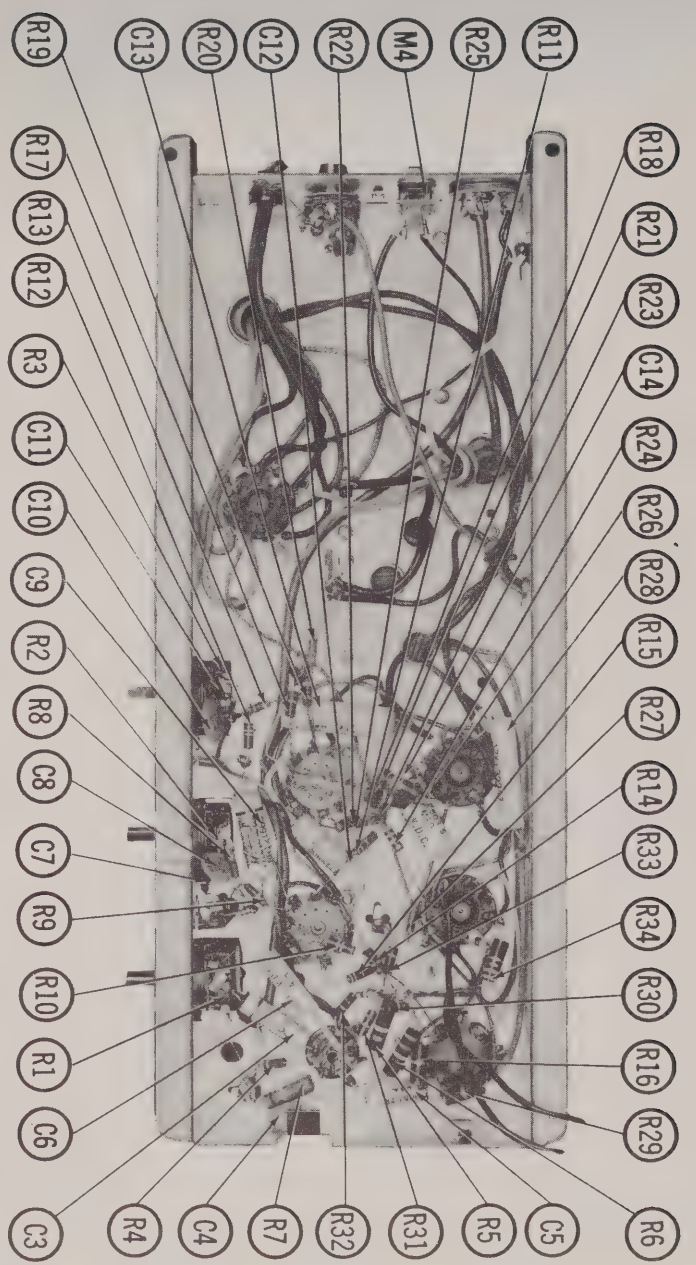
(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

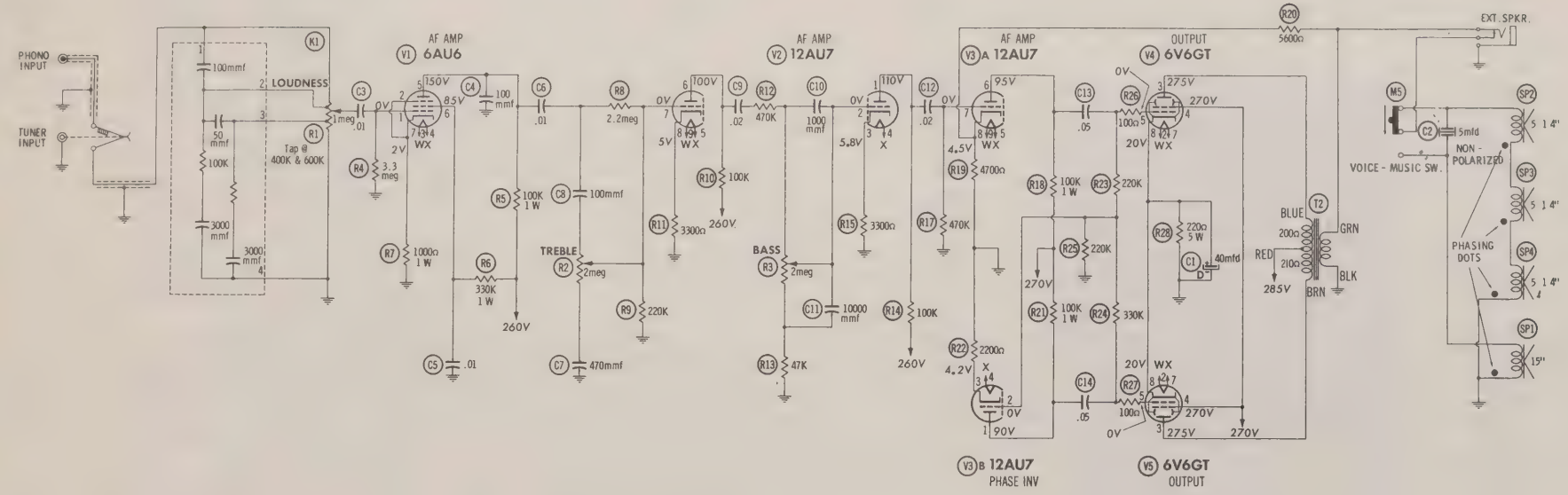
ITEM No.	REPLACEMENT DATA			REMARKS
	MOTOROLA PART No.	JENSEN PART No.	WALCO PART No.	
M2		†S-61 or †♦S-61SD or ♦S-61D	†W-77TPS or †♦W-77DS or ♦W-77TPD	† Jewel ♦ Diamond

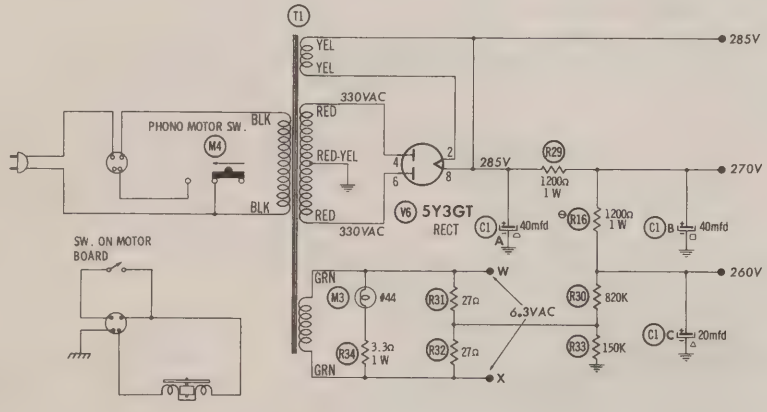
MISCELLANEOUS

ITEM No.	PART NAME	MOTOROLA PART No.	NOTES
M3	Pilot Lamp	65X10867	#44
M4	Phono Motor Sw.	40A690546	SPST - Slide Type
M5	Voice-Music Sw.	40A634440	SPDT - Slide Type (Model 67HFK Series Only)
	Cabinet	16E636260	Model 67HFK1.
	Cabinet	16K636261	Model 67HFK2.
	Cabinet	16K636262	Model 67HFK3.
	Cabinet	16K636263	Model 67HFK4.
	Cabinet	16E636381	Model 67HFP1.
	Cabinet	16E636300	Model 67HFT1.
	Knob	36K636253	Bass, Treble, Loudness.

CHASSIS—BOTTOM VIEW







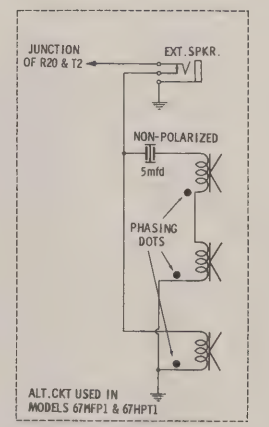
RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6AU6	3.3Meg	1000Ω	70K	70K	†100K	†330K	1000Ω		
V2	12AU7	†100K	47K	3300Ω	70K	70K	†100K	220K	3300Ω	70K
V3	12AU7	†100K	220K	2200Ω	70K	70K	†100K	470K	2600Ω	70K
V4	6V6GT	NC	70K	†200Ω	†1200Ω	440K	TP	70K	220Ω	
V5	6V6GT	NC	70K	†210Ω	†1200Ω	550K	TP	70K	220Ω	
V6	5Y3GT	NC	50K	TP	100Ω	TP	95Ω	TP	50K	

† MEASURED FROM PIN 8 OF V6.
NC NO CONNECTION.
TP TIE POINT

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

Θ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION



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RETMA MEMBER

OLYMPIC MODEL 447

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OLYMPIC MODEL 447

OLYMPIC MODEL 447

TRADE NAME	Olympic Model 447
MANUFACTURER	Olympic Radio & Tel. Corp., 34-01 38th. Ave., Long Island City 1, N.Y.
TYPE SET	Battery Operated Portable AM Transistorized Receiver
POWER SUPPLY	9 Volts DC RATING 25MA @ 9 Volts DC
TUNING RANGE—BROADCAST	540KC-1620KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to antenna stator lug on gang. Low side to chassis.	455KC (400~Mod)	Tuning gang fully open	Across voice coil	A1, A2, A3	Adjust for maximum output.
2.		Loop	1600KC	1600KC	"	A4	"
3.		"	1400KC	Tune to 1400KC signal	"	A5	"
4.		"	600KC	Tune to 600KC signal	"	A6	Adjust for maximum output while rocking tuning gang.

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PARTS LIST AND DESCRIPTIONS

TRANSISTORS

ITEM No.	USE	TYPE	NOTES
X1	Converter	GT766	Note 1
X2	IF Amplifier	GT766A	Note 2
X3	Driver	GT132	
X4	Output	GT751	Note 3

Note 1. Some versions may use CK760 or CK766.
Note 2. Some versions may use CK760A or CK766A.
Note 3. Some versions may use CK751.

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	OLYMPIC PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1	6	3	CO-4782	XPP3V6	NL6-3	TAW4A6	ML6-6	MMT-605	TE-1086
C2	30	6	CO-4808	SRE6V25	BBR50-6	TC26	ML30-6	MMT-650	TE-1092
C3	50	6	CO-4783	SRE6V50	BBR50-6	TC29	TD-50-6	MMT-650	TVA-1100
C4	50	6	CO-4783	SRE6V50	BBR50-6	TC29	TD-50-6	MMT-650	TVA-1100
C5	100	6	CO-4781	SRE6V100	BBR100-6	TC2501	TD-100-6	MTH-0610	TE-1102
C6	100	10	CO-4809	SRE12V100	BBR100-15	TC2501	TD-100-15	MTH-1210	TVA-1130

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	OLYMPIC PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C7	15			NP0-SI 15	TCZ-15	Z021	TCO-15		5TCC-Q15	Note 1
C8	50000		CCD-503X	BPD-05	DF-503					
C9	10000		CCD-103X	BPD-01	D6-103	K085	GP-10000	DC511	5HK-S1	
C10	50000		CCD-503X	BPD-05	DF-503					
C11	5.25		CO-4784							
C12	50000		CCD-503X	BPD-05	DF-503					
C13	50000		CCD-503X	BPD-05	DF-503					
C14	10000		CCD-103X	BPD-01	D6-103	K085	GP-10000	DC511	5HK-S1	

Note 1. Not used in some versions.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	OLYMPIC PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	10K	½	PT-4777	AB-15		Q13-116	U18	Volume
B	Shaft			AK-4		Not Req.	Not Req.	
C	Switch			KB-1		76-1	US-26	

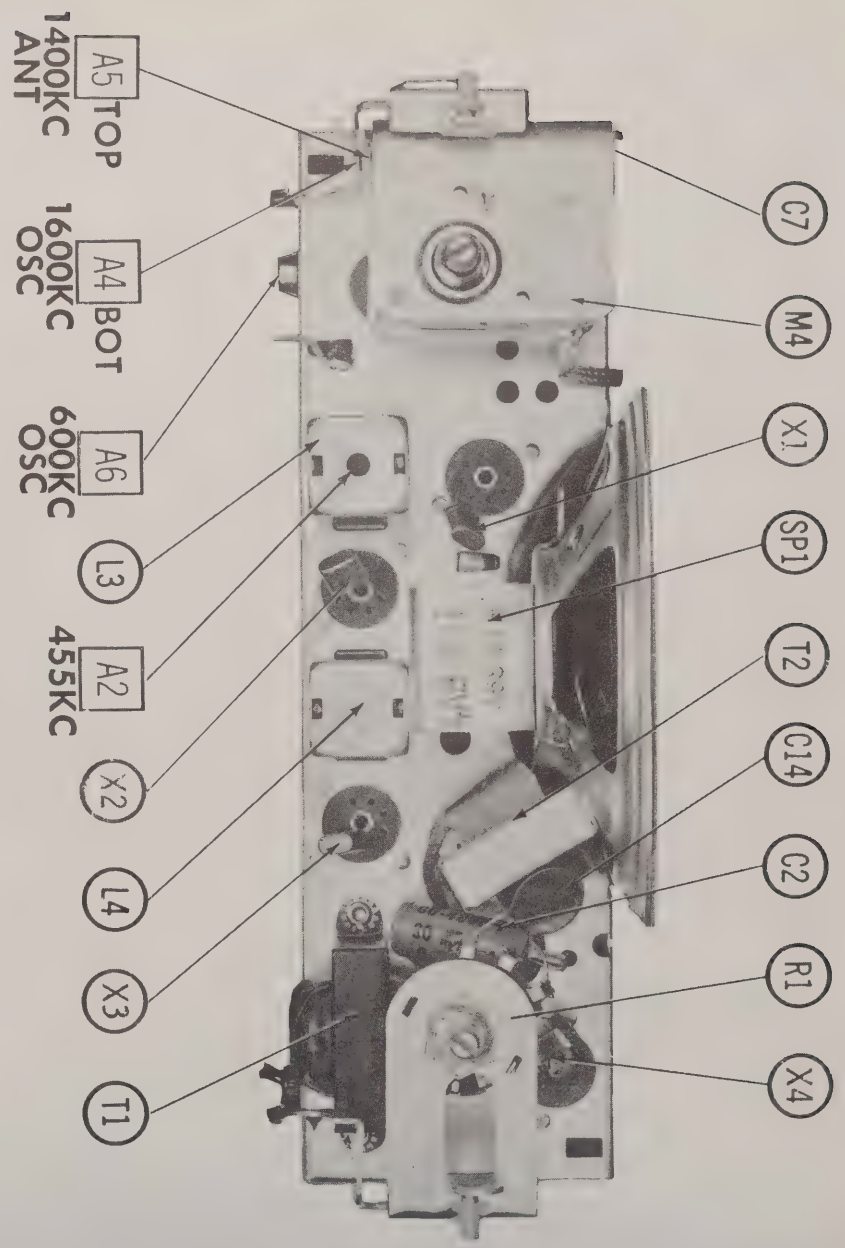
RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	OLYMPIC PART No.	IRC PART No.	
R2	18K		REB-183K	BTS-18K	
R3	47K		REB-473K	BTS-47K	
R4	5100Ω 5%		REB-512J	BTS-5100 5%	
R5	1000Ω		REB-102M	BTS-1000	
R6	1000Ω		REB-102M	BTS-1000	
R7	10K		REB-103M	BTS-10K	
R8	1000Ω		REB-102M	BTS-1000	
R9	1000Ω		REB-102M	BTS-1000	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	OLYMPIC PART No.	IRC PART No.	
R10	150K		REB-154M	BTS-150K	
R11	33K		REB-333M	BTS-33K	
R12	6800Ω		REB-682K	BTS-6800	
R13	1000Ω		REB-102M	BTS-1000	
R14	3300Ω		REB-332K	BTS-3300	
R15	560Ω		REB-561K	BTS-560	
R16	56Ω		REB-560K	BTS-56	
R17	150Ω		REB-151K	BTS-150	

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (DRIVER)

ITEM No.	Resistance PRI.	Resistance SEC.	REPLACEMENT DATA OLYMPIC PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	585Ω	11.4Ω	TR-4778				TR-26① ②		
	Turns Ratio 10: 1								

① Fabricate mounting.
② Tape center tap on secondary.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA OLYMPIC PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	700Ω	3-4Ω	SK-4779 ①				TR-29②③		

① Includes SP1
② Fabricate mounting.
③ Tape primary center tap.

SPEAKER

ITEM No.	TYPE SIZE	TYPE FIELD	TYPE V. C. IMP.	REPLACEMENT DATA OLYMPIC PART No.	QUAM PART No.	NOTES
SP1	4"	PM	3-4Ω	SK-4779 ①	4A07	① Includes T2

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA OLYMPIC PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	Loop Stick	LP-4773				
L2	Osc. Coil	CL-4774			2020	
L3	Input IF	TR-4775			2041	
L4	Output	TR-4776			2042	

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA OLYMPIC PART No.	SYLVANIA PART No.	NOTES
M1	*1N295		1N60	Audio Det. (Pigtail)

* Alternate type 1N64.

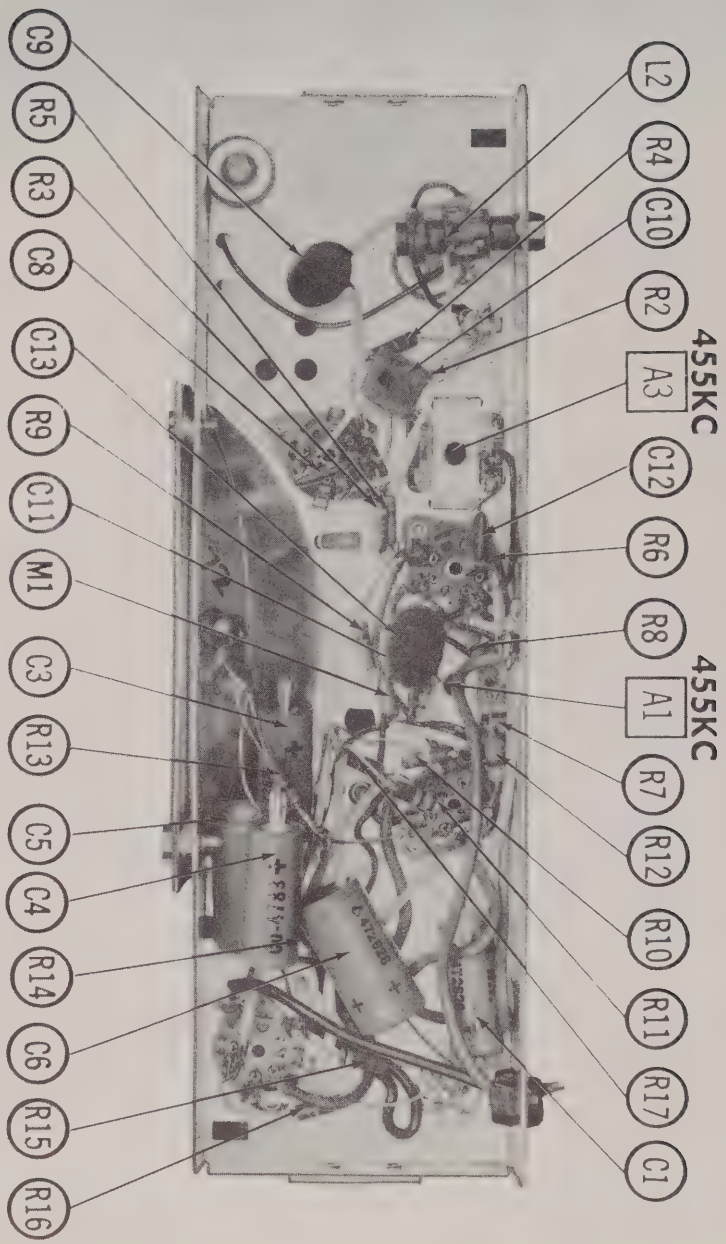
BATTERIES

ITEM No.	VOLTAGE	OLYMPIC PART No.	REPLACEMENT DATA EVEREADY "A"	EVEREADY "B"	EVEREADY "A-B"	BURGESS "A"	BURGESS "B"	BURGESS "A-B"	INSTALLATION NOTES
M2	9V "B"			276			D6		
M3	9V "B"			276			D6		

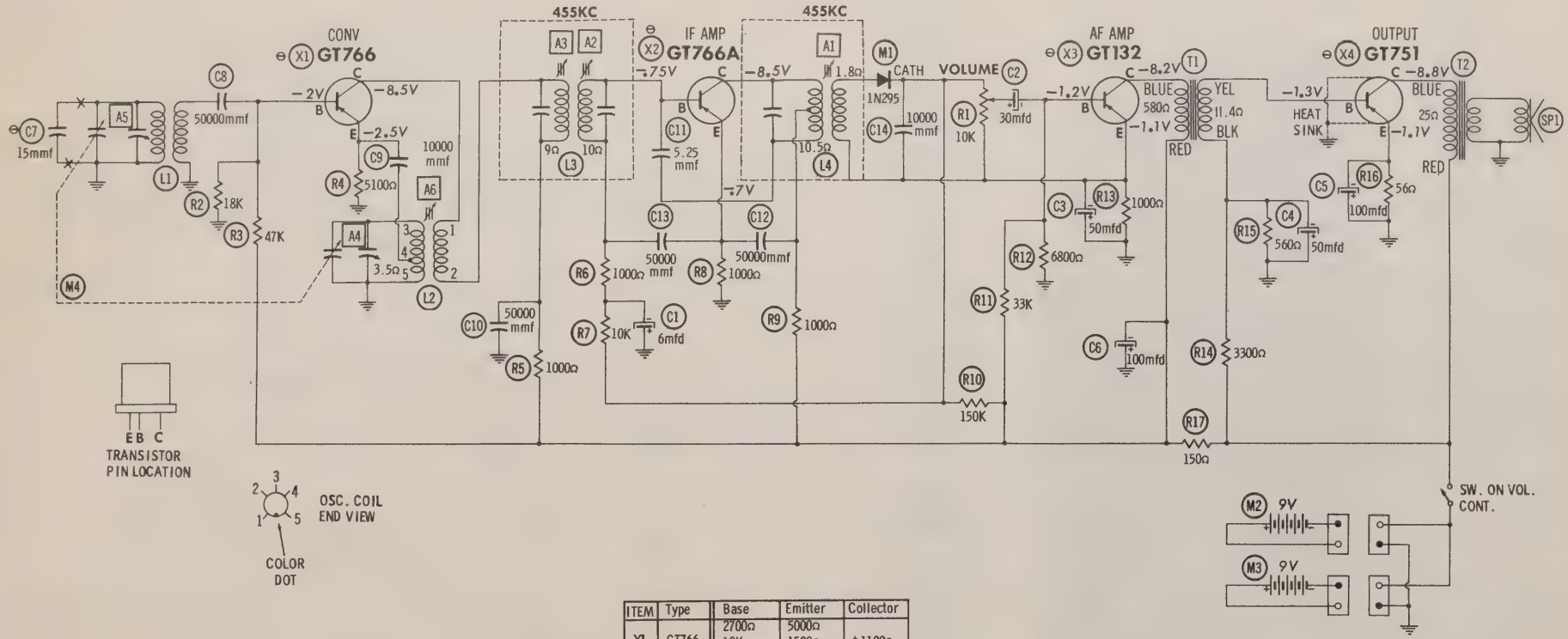
MISCELLANEOUS

ITEM No.	PART NAME	OLYMPIC PART No.	NOTES
M4	Tuning Cap.	CV-3300	Two gang (31-465MMF, 38-195MMF)
	Cabinet	CA-3304-1	Front
	Cabinet	CA-3305-1	Rear
	Knob	KN-3414	On-off-volume
	Knob	KN-3415	Tuning
	Knob	KN-3416	Dial
	Handle	MP-3307	

CHASSIS—BOTTOM VIEW



OLYMPIC MODEL 447



ITEM	Type	Base	Emitter	Collector
X1	GT766	2700Ω 12K	5000Ω 1500Ω	†1100Ω
X2	GT766A	1600Ω 20K	1000Ω 800Ω	†1100Ω
X3	GT132	1400Ω 5200Ω	1000Ω 700Ω	†730Ω
X4	GT751	100Ω 450Ω	56Ω 50Ω	†25Ω

DUAL READINGS INDICATE REVERSAL OF METER LEADS.
† MEASURED FROM JUNCTION OF R14 AND R17.

⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM.

1. DC voltage measurements taken with vacuum tube voltmeter.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
5. Volume control at maximum, no signal applied for voltage measurements.

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PACKARD-BELL
MODEL 21ST2 (Ch. 88S2)

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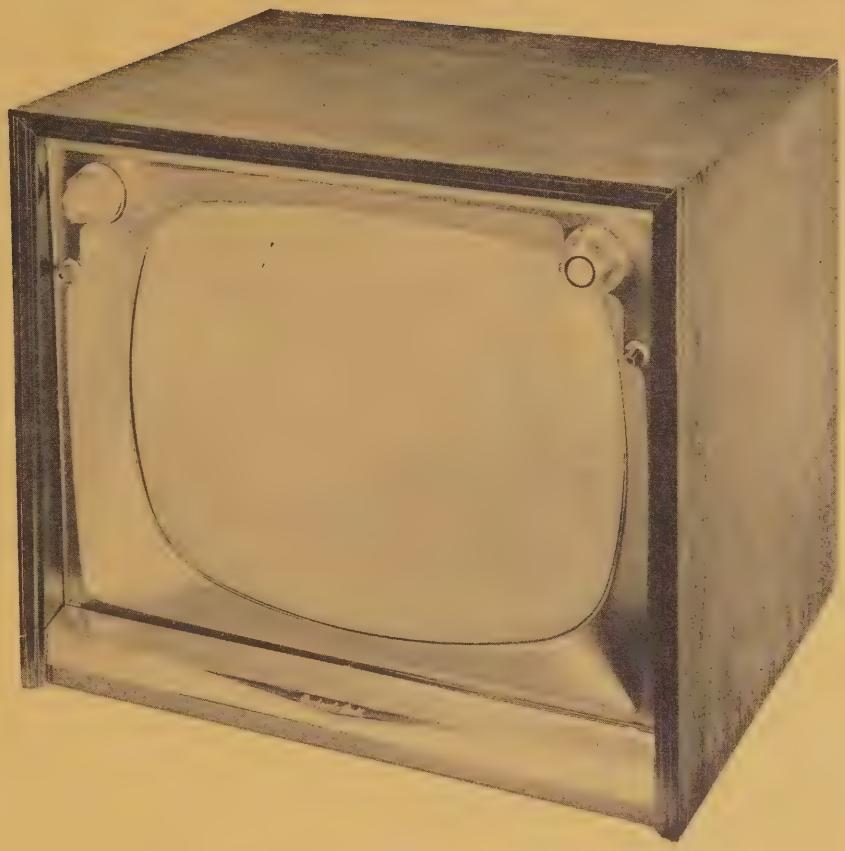

PACKARD-BELL MODEL 21ST2 (Ch. 88S2)

TRADE NAME	Packard-Bell Model 21ST2 (Ch. 88S2)
MANUFACTURER	Packard-Bell Co.-Service Div., 11th. & Hope Sts., Los Angeles 15, Calif.
TYPE SET	Television Receiver
TUBES	Eighteen
POWER SUPPLY	110-120 Volts AC - 60 Cycle RATING 1.65 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)

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MODEL 21ST2 (Ch. 88S2)

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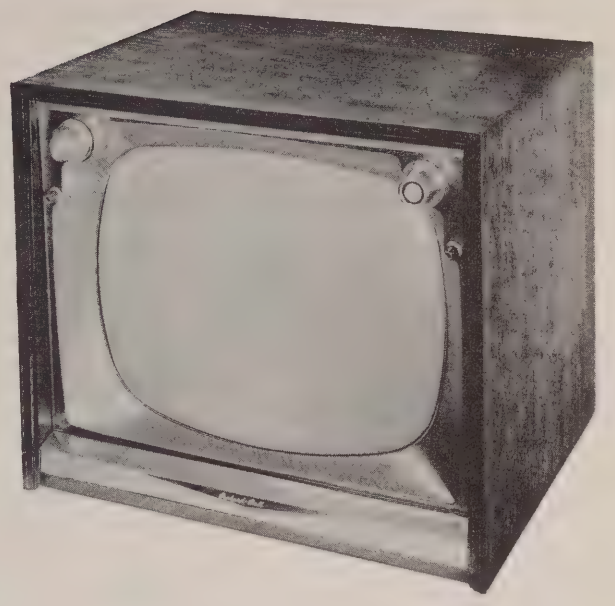
DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 7 push-on type knobs.
2. Remove 3 wood screws, metal strip and safety glass.
3. Remove 4 nuts holding control panels.
4. Remove 7 wood screws. Remove rear cover.
5. Remove 4 chassis bolts from bottom of cabinet.
6. Remove speaker plug.
7. Remove chassis.
8. Remove 4 speaker screws. Remove speaker.



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MODEL	CHASSIS
21ST2	88S2

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the VHF tuner oscillator circuit may be accomplished by removing the channel selector and fine tuning knobs.

PICTURE TUBE SAFETY GLASS CLEANING

Remove 7 push-on type knobs. Remove 3 wood screws holding metal strip. Using extreme caution remove safety glass.

SERVICE ADJUSTMENT LOCATION

See tube placement chart on page 5.

FOCUS

Focus may be varied by means of control R7. Adjust ion trap for best focus consistent with maximum brightness.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

Adjust the horizontal hold control until the picture synchronizes horizontally.

FUSES

One fuse is used for LV power supply protection. (For location see tube placement chart).
A $1\frac{1}{2}$" piece of #26 wire is used for filament circuit protection.

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube. Rotate the two rings around the neck of the tube until the picture is properly centered.

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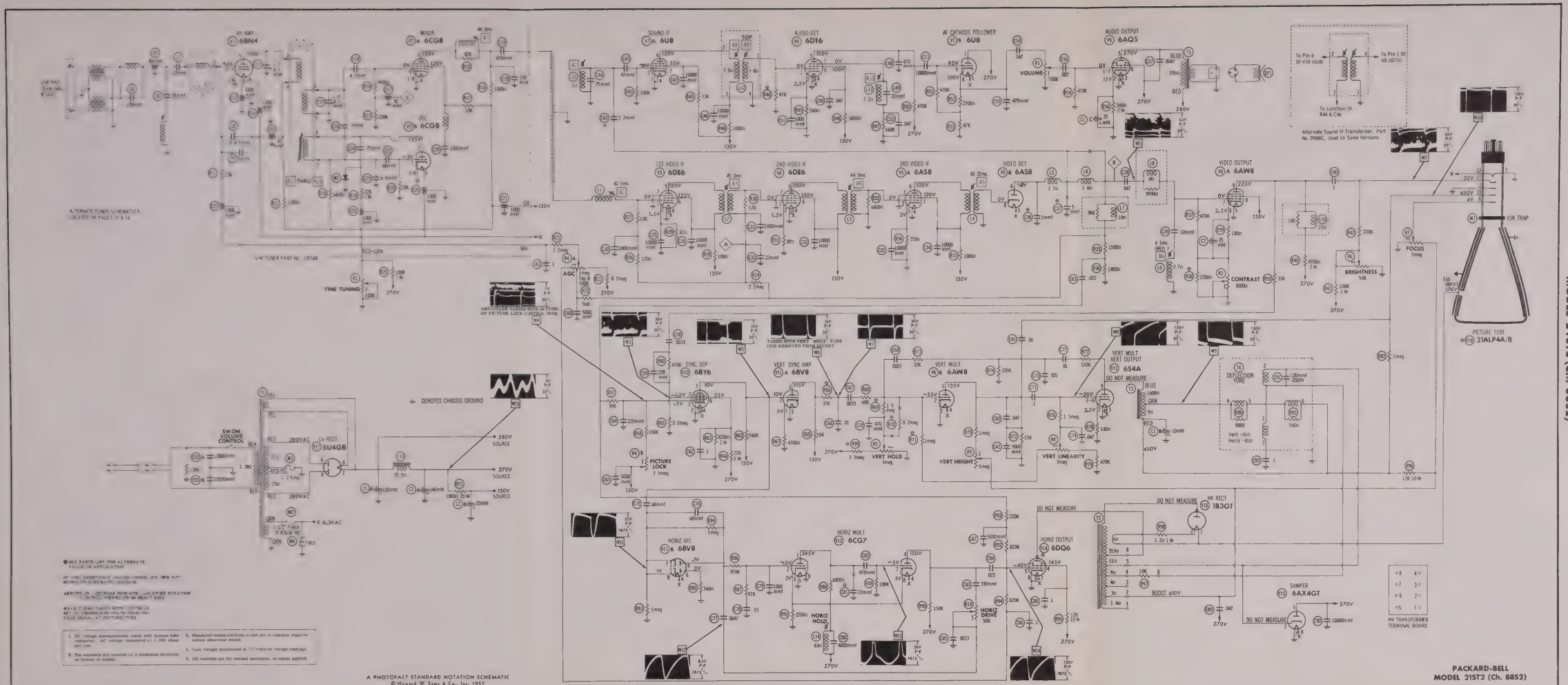
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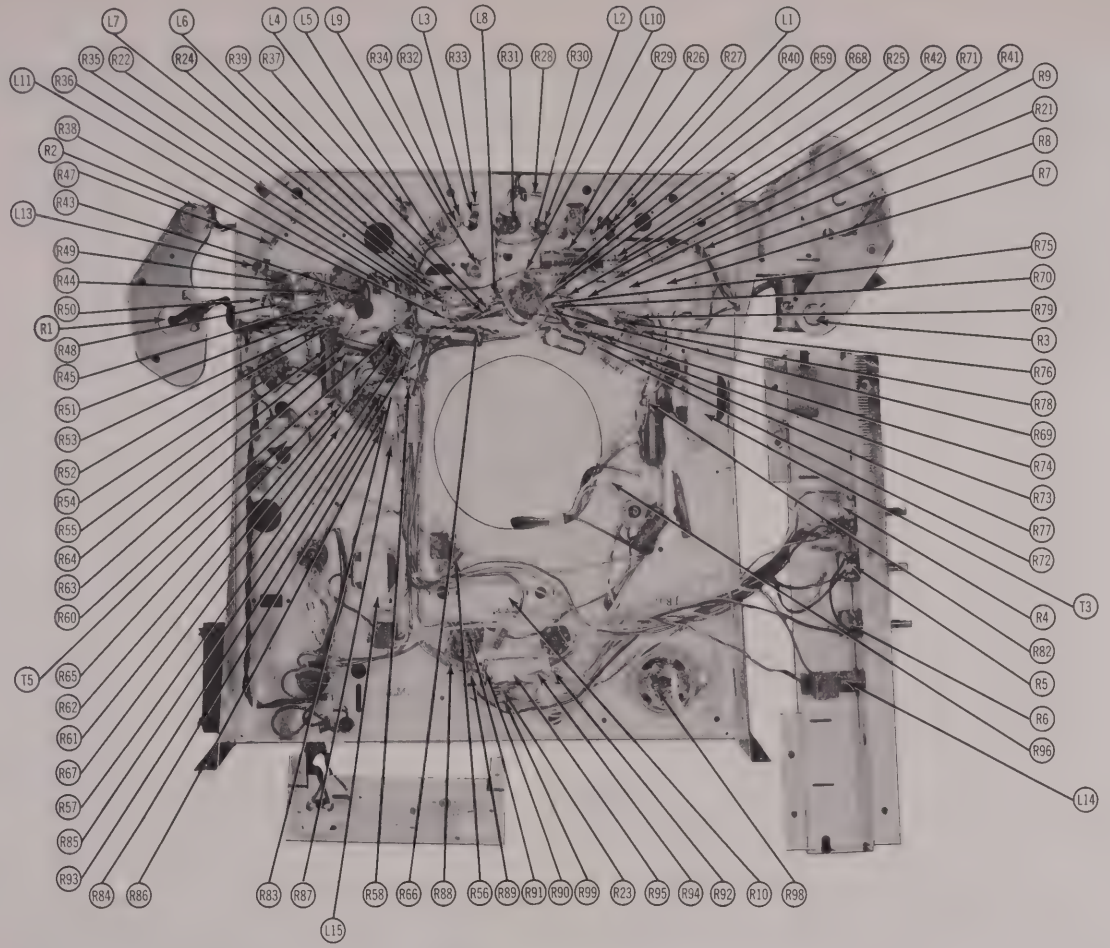

CHASSIS BOTTOM VIEW-RESISTOR AND INDUCTOR IDENTIFICATION

TUBE PLACEMENT CHART

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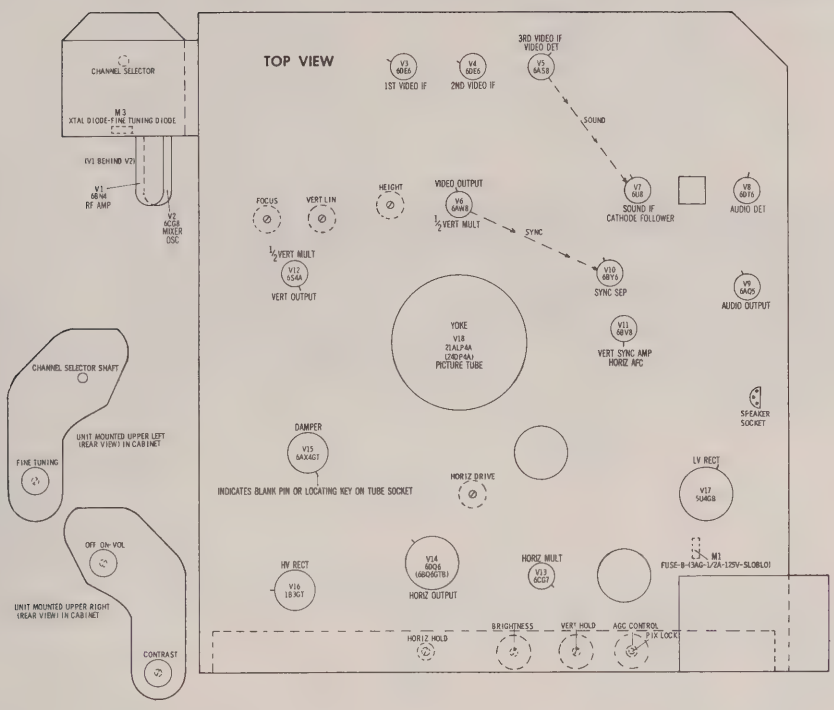

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MODEL 21ST2 (Ch. 88S2)

TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - V17, Fuse (M1), Fuse Wire (M2)

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - V3, V4, V5, V6, V18
No pic, no sound, has snow - V1, V2, V3
No pic, has sound, has raster - V6, V18
Has pic. no sound - V7, V8, V9

SYNC FAILURE
No vert. sync - V10, V11, V6, V12
No horiz. sync - V10, V11, V13
No vert. or horiz. sync - V10

SWEEP FAILURE
No raster, has sound - V11, V13, V14, V15, V16, V18
No vertical deflection - V6, V12
Poor vert. linearity or foldover - V6, V12
Poor horiz. linearity or foldover - V13, V14, V15
Narrow picture - V13, V14, V15, V17
Vert. off freq. - V10, V11, V6, V12
Horiz. off freq. - V10, V11, V13

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage lead should be securely taped and kept away from the chassis. Do not remove the horizontal oscillator tube (V13) to disable the high voltage. Allow 10 minute warm-up period for receiver and test equipment.

VIDEO IF ALIGNMENT

Do not connect a negative voltage to the AGC line.
Set generator output at maximum.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.	.001MFD	Vert. Amp. to point Ⓒ. Low side to chassis.	44.8MC	Any non-interfering channel	DC probe to point Ⓐ. Common to chassis.	A1	Adjust for maximum VTVM reading.
2.	"	"	42.5MC	"	"	A2	"
3.	"	"	45.0MC	"	"	A3	"
4.	"	"	44.0MC	"	"	A4	"
5.	"	"	43.25MC	"	"	A5	Adjust for maximum VTVM reading. Repeat steps 1 thru 5.

OVERALL VIDEO IF RESPONSE CHECK

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Use a separate marker generator and connect the hot lead to the ground connection of the tuner output cable. Leave the ground lead of the signal generator not connected.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
6.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	63MC (10MC Swp)	Not used	3	Vert. Amp. thru 22K to point Ⓑ. Low side to chassis.	R4A	Adjust sweep generator output and AGC control R4A to maintain -4 volts over entire AGC line.
7.	"	"	"	41.25MC 43.3MC 45.0MC 45.75MC	"	"		Check for response similar to Fig. 1. Retouch A2 for overall bandwidth . Retouch A1 to place 45.75MC marker at 50% on curve. Adjust A3 for the position of 45.0MC marker on response curve. Adjust A4 to place 41.25MC marker in position and to correct bottom portion of response curve. A5 controls shape of curve on low side. Note position of 45.0MC marker on response curve. It MUST not exceed 97% on channel 3.

4.5MC TRAP ALIGNMENT

If a 4.5MC signal generator of crystal accuracy capable of at least one volt output is not available tune in a TV station and adjust A6 for MINIMUM 4.5MC beat interference in the picture.
Adjust contrast control fully clockwise.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
8.	.001MFD	High side to point Ⓑ. Low side to chassis.	4.5MC (Unmod)	Any	DC probe thru detector (Fig. 2) to pin 11 (cathode) of picture tube. Common to chassis.	A6	Adjust for MINIMUM deflection with signal generator output of 1 volt or more.

SOUND IF ALIGNMENT

Turn the set on and tune in a TV station and adjust for a normal picture. Connect an adjustable attenuator between the antenna lead and the antenna terminals of the receiver. Adjust attenuation until the signal level is below the limiting level of the 6DT6 as indicated by a hiss in the sound. Adjust A7, A8, A9 and A10 for clearest sound and MINIMUM noise. If the circuit is badly misaligned, it will be necessary to repeat this procedure several times, decreasing the signal each time with the attenuator.

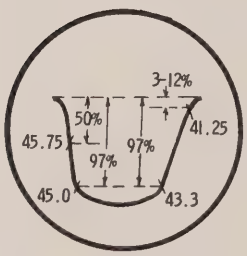


FIG. 1

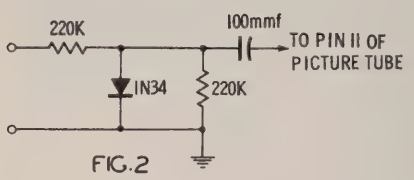


FIG. 2

ALIGNMENT INSTRUCTIONS (cont)

OSCILLATOR ALIGNMENT

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
*The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control the mid-position of its range.
Use only enough sweep generator output to provide usable pattern on scope.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
9.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	213MC (10MC Swp)	211.25MC 215.75MC	13	Vert. Amp. thru 47K to point Ⓑ. Low side to chassis.	All	Adjust to place sound marker in trap notch as in Fig. 3. Video marker should fall at 50%.
			207MC (10MC Swp)	205.25MC 209.75MC	12		A12	
			201MC (10MC Swp)	199.25MC 203.75MC	11		A13	
			195MC (10MC Swp)	193.25MC 197.75MC	10		A14	
			189MC (10MC Swp)	187.25MC 191.75MC	9		A15	
			183MC (10MC Swp)	181.25MC 185.75MC	8		A16	
			177MC (10MC Swp)	175.25MC 179.75MC	7		A17	
			85MC (10MC Swp)	83.25MC 87.75MC	6		A18	
			79MC (10MC Swp)	77.25MC 81.75MC	5		A19	
			69MC (10MC Swp)	67.25MC 71.75MC	4		A20	
			63MC (10MC Swp)	61.25MC 65.75MC	3		A21	
			57MC (10MC Swp)	55.25MC 59.75MC	2		A22	

RF AND MIXER ALIGNMENT

This portion of the receiver has been properly aligned at the factory and is very stable. Alignment of this portion should not be required in the field.

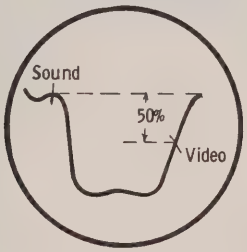
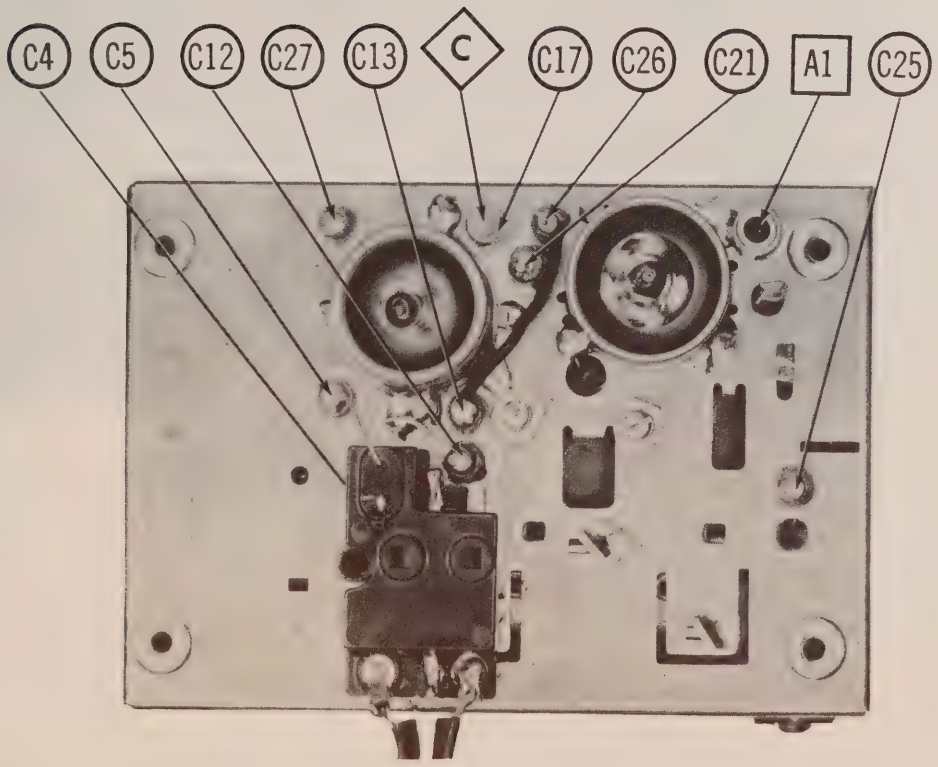
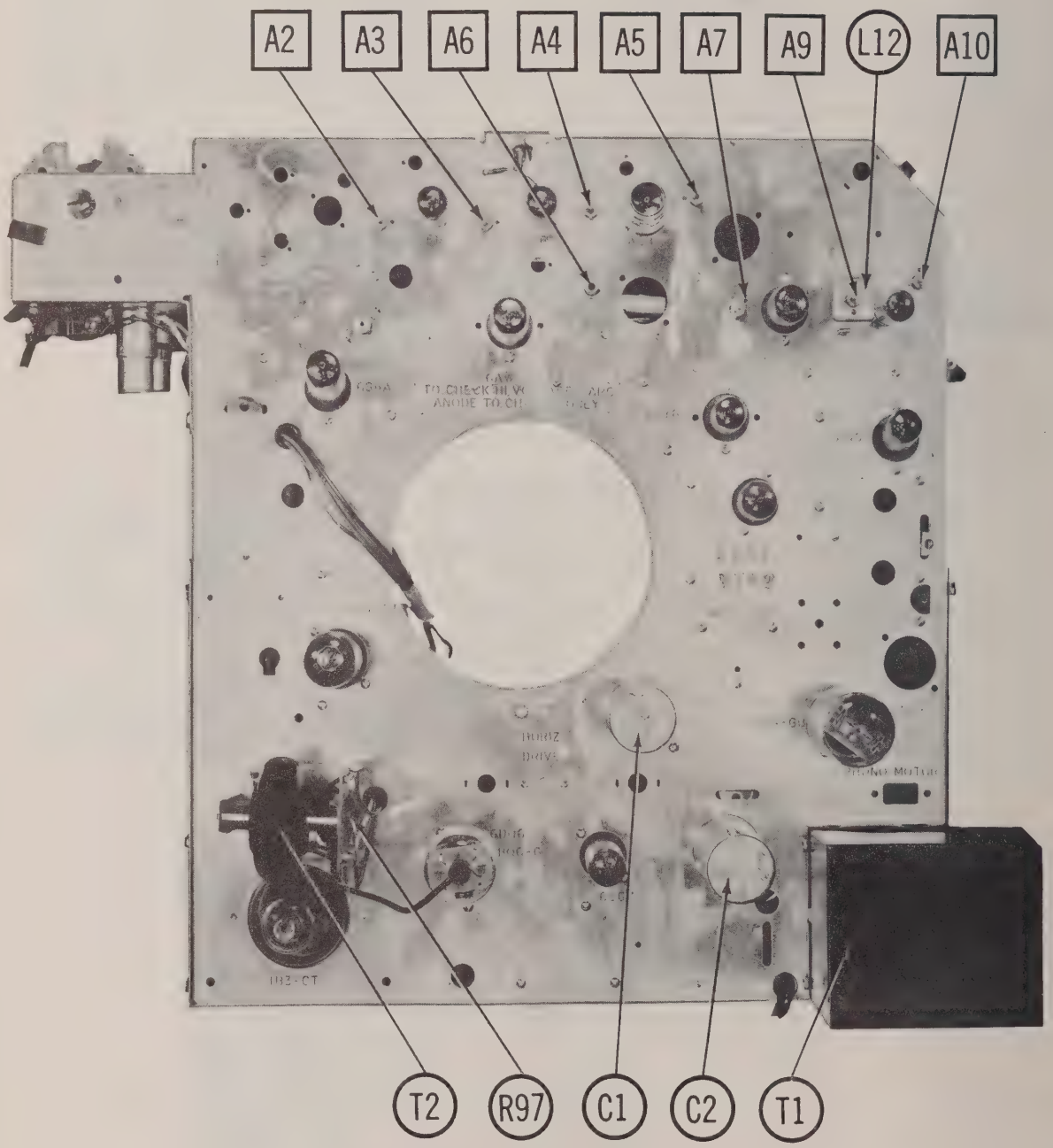


FIG. 3

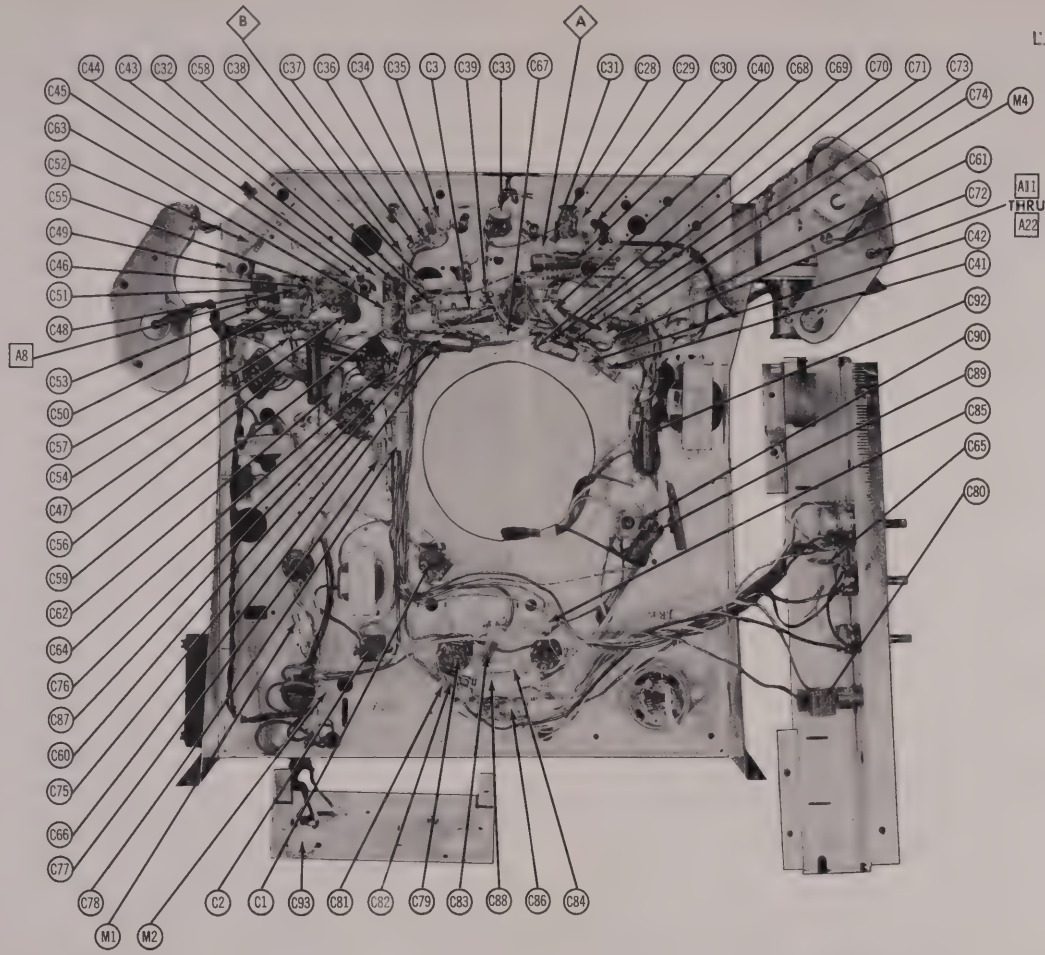


RF TUNER TOP VIEW



CHASSIS TOP VIEW

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE S,.
DENVER, COLORADO



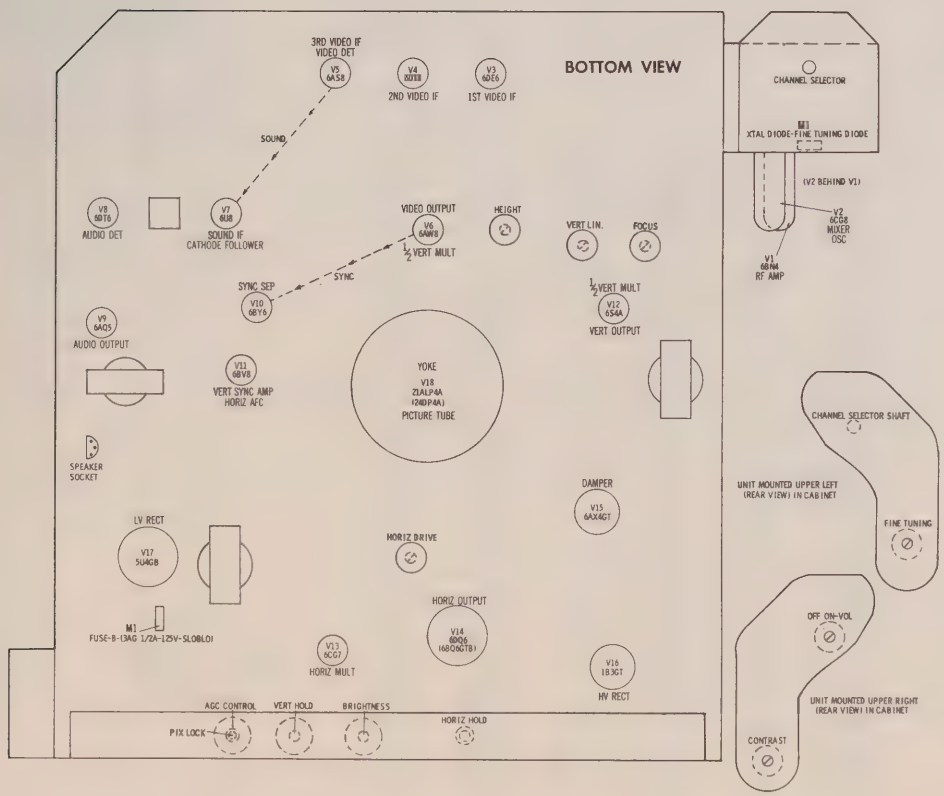
CHASSIS BOTTOM VIEW-CAPACITOR AND ALIGNMENT IDENTIFICATION

PACKARD-BELL
MODEL 215T2 (Ch. 88S2)

RESISTANCE MEASUREMENTS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6BN4	0Ω	2.2Meg	0Ω	.1Ω	†2800Ω	0Ω	2.2Meg		
V2	6CG8	10K	†7500Ω	0Ω	0Ω	.1Ω	†2800Ω	†12K	0Ω	224K
V3	6DE6	2.2Meg	82Ω	0Ω	.1Ω	†1900Ω	†1900Ω	0Ω		
V4	6DE6	2.2Meg	82Ω	0Ω	.1Ω	†1800Ω	†1800Ω	0Ω		
V5	6AS8	†2800Ω	.1Ω	270Ω	0Ω	.1Ω	3300Ω	0Ω	.1Ω	†2800Ω
V6	6AW8	0Ω	●1.5Meg	†3Meg	.1Ω	0Ω	180Ω	470K	†1800Ω	†4700Ω
V7	6U8	†38Ω	100K	†35K	0Ω	.1Ω	†3000Ω	0Ω	50K	500K
V8	6DT6	3.8Ω	560Ω	0Ω	.1Ω	†470K	†8500Ω	560K		
V9	6AQ5	470K	560Ω	.1Ω	0Ω	†373Ω	†38Ω	NC		
V10	6BY6	●120K	0Ω	0Ω	.1Ω	†560K	†15K	2.2Meg		
V11	6BV8	4700Ω	†560K	†12K	.1Ω	0Ω	560Ω	1Meg	1Meg	2Meg
V12	6S4A	NC	180Ω	●2.4Meg	0Ω	.1Ω	●2.4Meg	NC	NC	‡12K
V13	6CG7	†6800Ω	2.5Meg	2200Ω	.1Ω	0Ω	†150K	100K	2200Ω	0Ω
V14	6DQ6	NC	0Ω	NC	†12K	600K	NC	.1Ω	0Ω	TOP CAP ‡11Ω
V15	6AX4GT	TP	NC	350K	NC	†38Ω	TP	0Ω	.1Ω	
V16	1B3GT	PINS 1 THRU 8 HAVE INFINITE RESISTANCE								TOP CAP ‡326Ω
V17	5U4GB	NC	18K	NC	21Ω	TP	23Ω	NC	18K	
V18	21ALP4A	0Ω	0Ω	Pin 6 ‡●150Ω	Pin 10 ‡1Meg	Pin 11 †220K	Pin 12 .1Ω			

† MEASURED FROM PIN 2 OF V17.
‡ MEASURED FROM PIN 3 OF V15.
● THIS READING WILL VARY, CONTROL SET FOR NORMAL OPERATION.
NC NO CONNECTION
TP TIE POINT



TUBE PLACEMENT CHART

SET 349 FOLDER 8

PACKARD-BELL
MODEL 21ST2 (Ch. 88S2)

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No	USE	TYPE	NOTES
V1	RF Amplifier	6BN6	
V2	Mixer—Osc	6CU8	
V3	1st Video IF Amplifier	6DE6	
V4	2nd Video IF Amplifier	6DE6	
V5	3rd Video IF Amp.	6BY8	
V6	Video Det.	6AS8	
V7	Video Output—Vert. Multi.	6AW8	
V*	Sound IF Amplifier—Limiter—Ratio Detector	6U8	
V8	Audio Detector	6DT6	

ITEM No	USE	TYPE	NOTES
V9	Audio Output	6AQ8	
V10	Sync Sep.	6BY8	
V11	Vert. Sync. Amp. - Horiz. AFC	6BY8	
V12	Vert. Multi - Vert. Output	6S4A	
V13	Horiz. Output	6CG7	
V14	Damper	6DQ6	Note 1
V15	Damper	6AX4GT	
V16	HV Rectifier	1B3GT	
V17	LV Rectifier	5U4GB	

Note 1: 6BQ6GTB may be used in some versions.

PICTURE TUBE

ITEM No	REPLACEMENT DATA			NOTES
	Packard-Bell PART No.	GENERAL ELECTRIC PART No.	SYLVANIA PART No.	
V18	21ALP4A B	21ALP4A B	21ALP4A B	Aluminized
	21ALP4B	21ALP4A		silver Screen "85".
	21ALV4	21ALP4	21ALP4	
	24DP4A	24DP4A	24DP4A	
	24DP4		24DP4	

ELECTROLYTIC CAPACITORS

ITEM No	RATING		REPLACEMENT DATA					
	CAP	VOLT	Packard-Bell PART No	AEROVOX PART No	CORNELL DUBILIER PART No	MALLORY PART No	PYRAMID PART No	SANGAMO PART No	SPRAGUE PART No
C1A	●100	250		AFH3-105-60		FP300-1	TMT-197	T-537	TVL-3906, 4
B	●10	475						MT-4710	
C	●25	25							
C2A	●.40	250		AFH3-29-75	DO044	FP33L 8	TMT-184	T-180	TVL-3845
B	●.20	350						MT-4520	
C3	25	25		PR336V25	BR152	TC26	TD-25-25	FM-0225	TVA-1205

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No	RATING		REPLACEMENT DATA							NOTES
	CAP	VOLT	Packard-Bell PART No	AEROVOX PART No	CENTRALAB PART No	CORNELL DUBILIER PART No	ERIE PART No.	MALLORY PART No	SPRAGUE PART No	
C4	130			NPO-61-130	TCZ-130		TCO-130		5TCC-T13	
C5	30									
C6	28									
C7	12									
C8	4.5-4.5									
C9	5									
C10	47									
C11	4.5-4.5									
C12	1000									
C13	1000									
C14	4.7									
C15	4.5-4.5									
C16	.5			TCZ-R5		TCO-.5				
C17	30									
C18	100			NPO-61-100	TCZ-100	C1STIC	TCO-100	2T-581	5TCC-T1	
C19	470			BPD-0047	DD-471	BYA107A7	ED-470	UC-5347	5GA-T47	
C20	1000			BPD-001	DD-393	BYA6D1	ED-1000	DC521	5HK-DI	
C21	1000									
C22	68									
C23	6.8									
C24	.75							2T-5675		
C25	1000									
C26	1000									
C27	1000									
C28	1000			BPD-01	DD-103	BYA6S1	GP-10000	DC51	5HK-S1	
C29	1000			BPD-01	DD-103	BYA6S1	GP-10000	DC51	5HK-S1	
C30	1000			BPD-001	DD-103	BYA6D1	ED-1000	DC521	5HK-DI	
C31	.000			BPD-001	DD-102	BYA6D1	ED-1000	DC521	5HK-DI	
C32	22			P28BN-22		CUB3P22		GEM-3022	2TM-P22	
C33	.0000			BPD-01	DD-103	BYA6S1	GP-10000	DC51	5HK-S1	
C34	.0000			BPD-01	DD-103	BYA6S1	GP-10000	DC51	5HK-S1	
C35	.0000			BPD-01	DD-103	BYA6S1	GP-10000	DC51	5HK-S1	
C36	5			S1 5	BD-050	L10V5	ED-5	2T-555	5GA-V5	Note 1
C37	51 5			S1 5	DD-050	L10V5	ED-5	2T-555	5GA-V5	Note 2
C38	.047	300		BPD-05	DF-503	CUB3S47		GEM-4147	2TM-S47	
C39	22			S10	DD-100	L10Q	ED-10	UC-541	5GA-Q	
C40	1.	600		P68N-1	DF-104	CUB6P1		GEM-601	6TM-P1	
C41	01	600		BPD-01	DD-103	CUB6S1	GP-10000	GEM-61	6TM-S1	
C42	5000			BPD-005	DD-502	BYA10D5	GP-5000	DC525	5HK-D5	
C43	2, 2			NPO-613 2	TCZ-3R2	C10V22C	TCO-2.2		5TCCB-V22	Note 3
C44	3.3			NTO-3T3	TCN-T3	C10QT3U	TCT-T3	NT-5475	5TCC-Q73	
C45	47			BPD-00004F	DD-470	L10Q47	ED-47	UC-5447	5GA-Q47	
C46	01			BPD-01	DD-103	BYA6S1	GP-10000	DC51	5HK-S1	
C47	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC51	5HK-S1	
C48	470			BPD-0047	DD-471	BYA10T47	ED-470	UC-5347	5GA-T47	
C49	22			NPO-6122	TCZ-22	C10Q22C	TCO-22		5TCC-Q22	
C50	.047	400		BPD-05	DF-503	CUB4S47		GEM-4147	4TM-S47	
C51	1000			BPD-001	DD-103	BYA10D1	ED-1000	DC521	5HK-DI	
C52	.047	300		BPD-05	DF-503	CUB3S47		GEM-2147	2TM-S47	
C53	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC51	5HK-S1	
C54	.047	400		BPD-05	DF-503	CUB4S47		GEM-4147	4TM-S47	
C55	470			BPD-0047	DD-471	BYA10T47	ED-470	UC-5347	5GA-T47	
C56	.033	200		BPD-03	DF-333	CUB2S22	ED-02	GEM-2222	2TM-S22	
C57	.0047	600		BPD-0047	D6-472	CUB6D47	GP-4700	GEM-6247	6TM-D47	
C58	.033	200		BPD-0033	D6-333	CUB2D33	GP-3300	GEM-6233	6TM-D33	
C59	220			BPD-0022	DD-221	L10T22	ED-220	UC-5322	5GA-T22	
C60	5000			BPD-005	DD-502	BYA10D5	GP-5000	DC525	5HK-D5	
C61	.1	300		P28M-1	DF-104	CUB2P1		GEM-201	2TM-P1	
C62	022	1000		BPD-03	DF-333	CUB3S22	ED-02	GEM-3222	3TM-S22	
C63	220			BPD-0022	DD-221	L10T22	ED-220	UC-5322	5GA-T22	
C64	5000			BPD-005	DD-502	BYA10D5	GP-5000	DC525	5HK-D5	
C65	01	600		BPD-01	DD-103	CUB6S1	GP-10000	GEM-61	6TM-S1	
C66	.0033	600		BPD-0033	D6-332	CUB6D33	GP-3300	GEM-6233	6TM-D33	
C67	.0022	400		BPD-0022	D6-222	CUB4D22	GP-2200	GEM-4222	4TM-D22	
C68	.047	600		BPD-05	DF-503	CUB6S47		GEM-6147	6TM-S47	
C69	470			BPD-0047	DD-471	BYA10T47	ED-470	UC-5347	5GA-T47	
C70	1.	600		P68M-1	DF-104	CUB6P1		GEM-601	6TM-P1	
C71	01	600		BPD-01	DD-103	CUB6S1	GP-10000	GEM-61	6TM-S1	
C72	01	600		BPD-001	DD-103	CUB6D1	GP-1000	GEM-601	6TM-D1	
C73	.047	300		BPD-05	DF-503	CUB3S47		GEM-6147	2TM-S47	

PARTS LIST AND DESCRIPTIONS

CAPACITORS (cont)

ITEM No	RATING		REPLACEMENT DATA							NOTES
	CAP	VOLT	Packard-Bell PART No	AEROVOX PART No	CENTRALAB PART No	CORNELL DUBILIER PART No	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No	
C75	68			NPO-6168	TCZ-68	C1QM68	TCO-68		5TCC-Q68	
C76	68			NPO-6168	TCZ-68	C1QM68	TCO-68		5TCC-Q68	
C77	.0047	600		BPD-0047	DD-472	CUB6D47	GP-4700	GEM-6247	6TM-D47	
C78	15	200		P28BN-15		CUB2P15		GEM-3015	2TM-P15	
C79	1000			BPD-001	DD-102	BYA6D1	ED-1000	DC521	5HK-DI	
C80	6000			1467-0039		1467-0039		MC-663	MS-34	
C81	22			NPO-6122	TCZ-22	C10Q22C	TCO-22	UC-5423	5TCC-Q22	Note 2
C82	470			1468-00047		BWT47			MS-347	
C83	330			1468-00033		BWT33			MS-333	
C84	.022	600		BPD-03	DF-303	CUB6S22	ED-02	GEM-6122	6TM-S22	
C85	.0033	600		BPD-0033	D6-332	CUB6D33	GP-3300	GEM-6233	6TM-D33	
C86	1	200		P28BN-1	DF-104	CUB2P1		GEM-201	2TM-P1	
C87	5000			BPD-005	DD-502	BYA10D5	GP-5000	DC521	5HK-D5	
C88	1	600		P68N-1	DF-104	CUB6P1		GEM-601	6TM-P1	
C89	.047	600		BPD-05	DF-503	CUB6S47		GEM-6147	6TM-S47	
C90	10000			BPD-01	DD-103	BYA6S1	GP-10000	DC51	5HK-S1	
C91	130	2000								
C92	.1	600		P68N-1	DF-104	CUB6P1		GEM-601	6TM-P1	
C93A	10000			BPD-2X01	DDM2-103	BYD6DS1	GP-10000	DC51	5HK-2S1	
B	10000						GP-10000	DC51		

Note 1: Some versions use a 4. 7MMF in this application.
Note 2: Not used in some versions.
Note 3: Some versions use 10MMF in this application.

CONTROLS

ITEM No	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE		Packard-Bell PART No	CENTRALAB PART No	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No	
R1A	500K	½		B-50-3	A47-500K-2	Q13-133	U48	Volume
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	
C	Switch			Not Req.	SWE-12	76-1	US-26	
R2A	3000Ω	½			Q17-132	Not Req.		Contrast
B	Shaft				Not Req.			
R3A	100K	½		AB-61	A47-100K-2	Q13-128	U39	Fine Tuning
B	Shaft			AK-4	KBS-1	Not Req.	Not Req.	
R4A	1Meg	½					UE-1878	AGC - Tap@ 500K
B	1. 5Meg	½					Not Req.	Picture Lock
R5A	2Meg	½		AB-85	A47-2Meg-2	Q13-140	U57	Vert. Hold
B	Shaft			AK-4	KBS-1	Not Req.	Not Req.	
R6A	50K	½		AB-51	A47-50K-S	Q13-131	U35	Brightness
B	Shaft			AK-6	KBS-1	Not Req.	Not Req.	
R7A	5Meg	½		AB-87	A47-5Meg-S	Q11-141	TA54L	Focus
B	Shaft			AK-1	FKS-1/4	TM1-KIT	Not Req.	
R8A	2Meg	½		AB-84	A47-2Meg-S	Q11-140	TA38L	Vert. Linearity
B	Shaft			AS-1	FKB-1/4	Not Req.	Not Req.	
R9A	5Meg	½		AB-87	A47-5Meg-S	Q11-141	PTA54L	Vert. Height
B	Shaft			AK-1	FKS-1/4	Not Req.	Not Req.	
R10A	50K	½		BX-31	A47-50K-S	Q11-133	PTA54L	Horiz. Drive
B	Shaft			Not Req.	FKS-1/4	Not Req.	Not Req.	

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No	RATING		REPLACEMENT DATA			NOTES
	OHMS	WATT	Packard-Bell PART No	IRC PART No.		
R11	10K			BTS-10K		
R12	1000Ω			BTS-1000		
R13	220K			BTS-220K		
R14	3900Ω			BTS-3900		
R15	82K			BTS-82K		
R16	1000Ω			BTS-1000		
R17	10K			BTS-10K		
R18	68000			BTS-68000		
R19	22K	1		BTA-22K		
R20	10K			BTS-10K		
R21	5. 2Meg			BTS-5. 2Meg		
R22	5. 2Meg			BTS-5. 2Meg		Note 3
R23	56K			BTS-56K		
R24	2. 2Meg			BTS-2. 2Meg		
R25	100K	1		BTA-100K		Note 3
R26	120Ω			BTS-120		
R27	10K			BTS-10K		
R28	100Ω			BTS-100		
R29	82Ω			BTS-82		
R30	12K					
R31	82Ω			BTS-82		
R32	68000			BTS-68000		
R33	1000Ω			BTS-1000		
R34	270Ω			BTS-270		
R35	1500Ω			BTS-1500		
R36	18000			BTS-1800		
R37	470K			BTS-470K		
R38	22000			BTS-2200		Note 1
R39	180Ω			BTS-180		
R40	4700Ω	2		BTS-4700		
R41	100K	1		BTA-100K		
R42	220K			BTS-220K		
R43	100K			BTS-100K		
R44	10000			BTS-10K		
R45	33K			BTS-33K		
R46	47K			BTS-47K		Note 3
R47	560K			BTS-560K		
R48	6800Ω			BTS-6800		
R49	5600			BTS-560		
R50	470K			BTS-470K		
R51	470K			BTS-470K		
R52	2700Ω			BTS-2700		
R53	47K			BTS-47K		
R54	470K			BTS-47KX		Note 7

ITEM No	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	Packard-Bell PART No	IRC PART No.	
R55	1800Ω	20		2D-1750	
R56	560Ω	2		BTB-560	
R57	39K			BTS-39K	
R58	150K			BTS-150K	
R59	33K			BTS-33K	
R60	470K			BTS-470K	
R61	2. 2Meg			BTS-2. 2Meg	
R62	180K			BTS-180K	
R63	2200Ω	2		BTB-2200	
R64	33K	2			
R65	10K			BTS-10K	
R66	33K			BTS-33K	
R67	4700Ω			BTS-4700	
R68	68K			BTS-68K	
R69	1. 5Meg			BTS-1. 5Meg	Note 4
R70	8. 2Meg			BTS-8. 2Meg	Note 2
R71	1Meg			BTS-1Meg	Note 5, 8
R72	15K 5%			BTS-15K 5%	
R73	33K			BTS-33K	
R74	220K			BTS-220K	
R75	1Meg			BTS-1Meg	
R76	1. 5Meg			BTS-1. 5Meg	
R77	150K			BTS-150K	
R78	180K			BTS-180	
R79	470K			BTA-470K	
R80	560Ω				
R81	560Ω				
R82	1Meg			BTS-1Meg	
R83	1Meg			BTS-1Meg	
R84	1Meg				
R85	680Ω				
R86	470K				
R87	47K				
R88	680Ω				
R89	100K				
R90	150K				
R91	2200Ω				
R92	330Ω				
R93	220K				
R94	820K				
R95	1K	10		1 3/4A-12K	
R96	1K	10		1 3/4A-12K	
R97	10K			BTB-10K	
R98	1. 2Ω	1		BW1-L 2	
R99	3. 3Meg				Note 7

Note 1: A 3300Ω resistor used in some versions.
Note 2: Not used in some versions.
Note 3: A 22K resistor used in some versions.
Note 4: A 1Meg resistor used in some versions.
Note 5: A 1. 5Meg resistor used in some versions.
Note 6: A 1. 3Meg resistor used in some versions.
Note 7: A 4. 7Meg resistor is used in some versions.

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI	SEC. 1	SEC. 2	SEC. 3	Packard-Bell PART No	Halldorson PART No	Merit PART No	Stancor PART No	Thordarson PART No	Triad PART No
T1	117VAC	550VCT	5V	6. 3V	89056-B					
	@1. 65A	@. 280A	@ 3A	@ 9A						

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA						
		Packard-Bell PART No	Halldorson PART No	Merit PART No	RCA TYPE No	Ram PART No	Stancor PART No	Thordarson PART No	Triad PART No
T2	Horiz. Output Trans.	89058-B	FB420* ①	HVO-54* ①			X12* ①	A-8255* ①	FLY-76* ①	D-49* ①
T3	Vert. Output Trans.	89434-C	21808	A-3059	226T1			A-8141	26054	A-104X
T4A	Yoke 90° Horiz (23MH) Vert (39MH)	29590-C						DY-23A ②		
B								③		

① Drill new mounting hole(s)
② Use original yoke rear cover and centering device.
③ Use original horiz. yoke damping network.

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type Is Listed

ORIGINAL TERMINAL CONNECTIONS	Halldorson Replacement Connections	Merit Replacement Connections	RCA Replacement Connections	Ram Replacement Connections	Stancor Replacement Connections	Thordarson Replacement Connections	Triad Replacement Connections
8	5	5		5	5	5	5
5	4	4		4	4	4	4
4	NC See Note ④	NC See Note ④		NC See Note ④	NC See Note ④	NC See Note ④	NC See Note ④
(NC) 3	NC	NC		NC	NC	NC	NC
2	1	1		1	1	1	1
(NC) 1	NC	NC		NC	NC	NC	NC

④ To reduce yoke ringing, install 10000Ω ½ Watt resistor in series with capacitor C31 across terms #2 & #1 of horiz. yoke.
NC - No Connection.

TRANSFORMER (AUDIO OUTPUT)

ITEM No	IMPEDANCE		REPLACEMENT DATA					NOTES
	PRI	SEC	Packard-Bell PART No	Halldorson PART No	Merit PART No	Thordarson PART No	Triad PART No	
T5	4. 7K	3-4Ω	89436A	21107	A-2930	A-5950	24051	S-2X

SPEAKER

ITEM No.	TYPE				REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C.	IMP	Packard-Bell PART No	CHAM PART No	
SP1	4	PM	3-4Ω		83014	4A07	

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA			NOTES
		Packard-Bell PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No	
L1	1st Video IF			TV-131	6225	
L2	2nd Video IF		17-4533	TV-130	6219	
L3	3rd Video IF	29585	17-4534	TV-130	6218	
L4	4th Video IF	29587	17-4532	TV-130	6212	
L5	Series Peaking Coil		18-2804		6623	11 Microhenries
L6	Series Peaking Coil		18-2804		6623	11 Microhenries
L7	Shunt Peaking Coil		19-4301*	TV-184*	6154*	200 Microhenries; Wound on 2MΩ resistor.
L8	Series Peaking Coil		19-3085+	TV-181+	6277+	90 Microhenries; Wound on 180KΩ resistor.
L9	4. 5MC Trap	29648			1470	
L10	Shunt Peaking Coil		19-4400=		6136=	417 Microhenries; Wound on 18K resistor.
L11	1st Sound IF	29053	20-3004	TV-151	1689	
L12	2nd Sound IF	29060				
L13	Quadrature Coil	29081			1480	

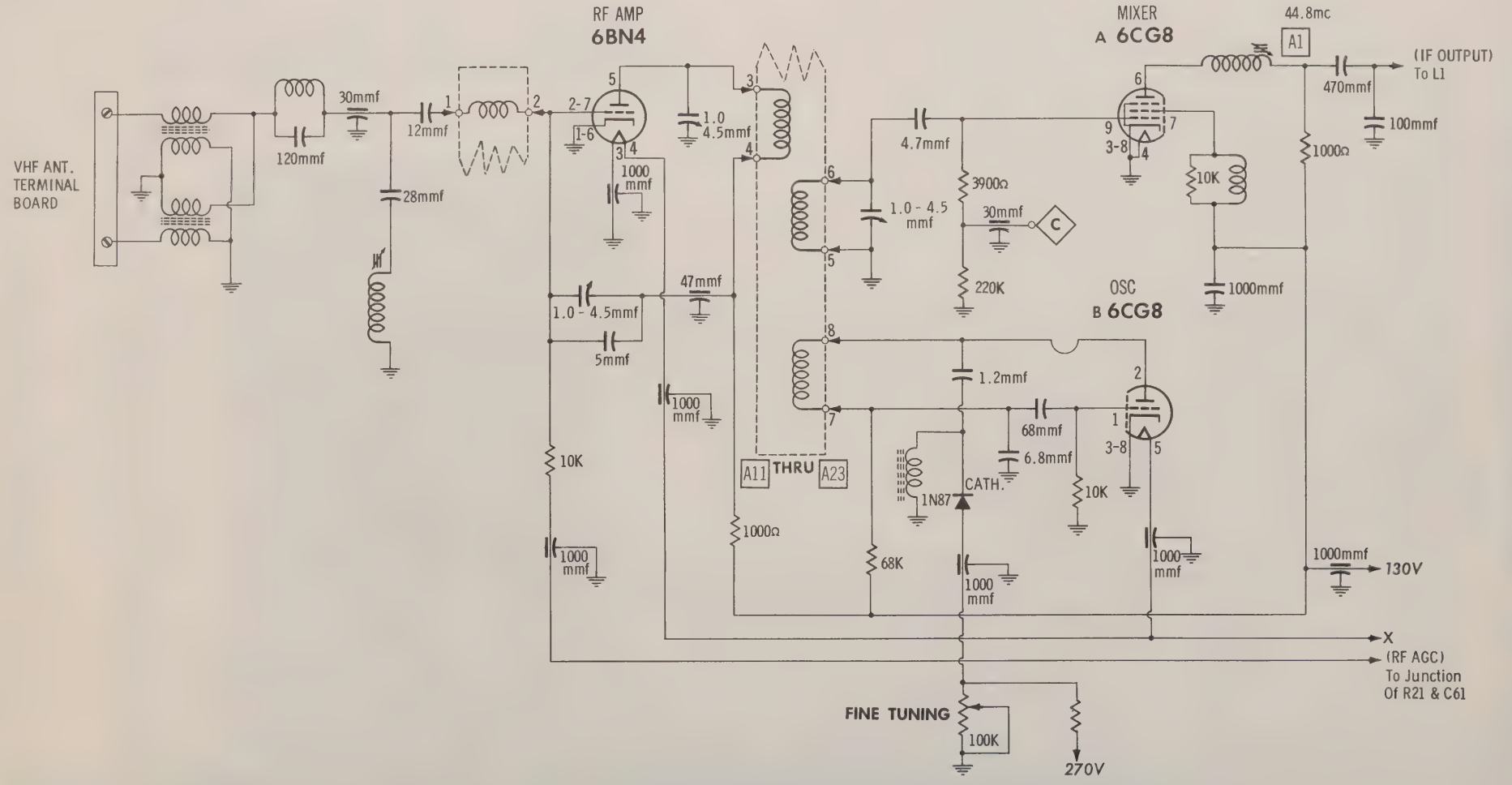
* Parallel with 39K resistor
+ Parallel with 3900Ω resistor.
= Parallel with 18K resistor.

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES		REPLACEMENT DATA							NOTES
	PRI	SEC.	Packard-Bell PART No.	MEISSNER PART No	MERIT PART No	MILLER PART No	RCA TYPE No	Ram PART No	Thordarson PART No	
L14	63Ω		29589	19-1578	TV-185	6210			HS-5	31-40 Millihenries

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA				
	TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE @ CURRENT 1000 ^A/_T	Packard-Bell PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No
L15	.335A	37. 5Ω	1H†	27006B	C5037 ①	C-3996 ①	C-8326 ①	26C44 ①	C-25X ①



VHF TUNER PART NO. 10566

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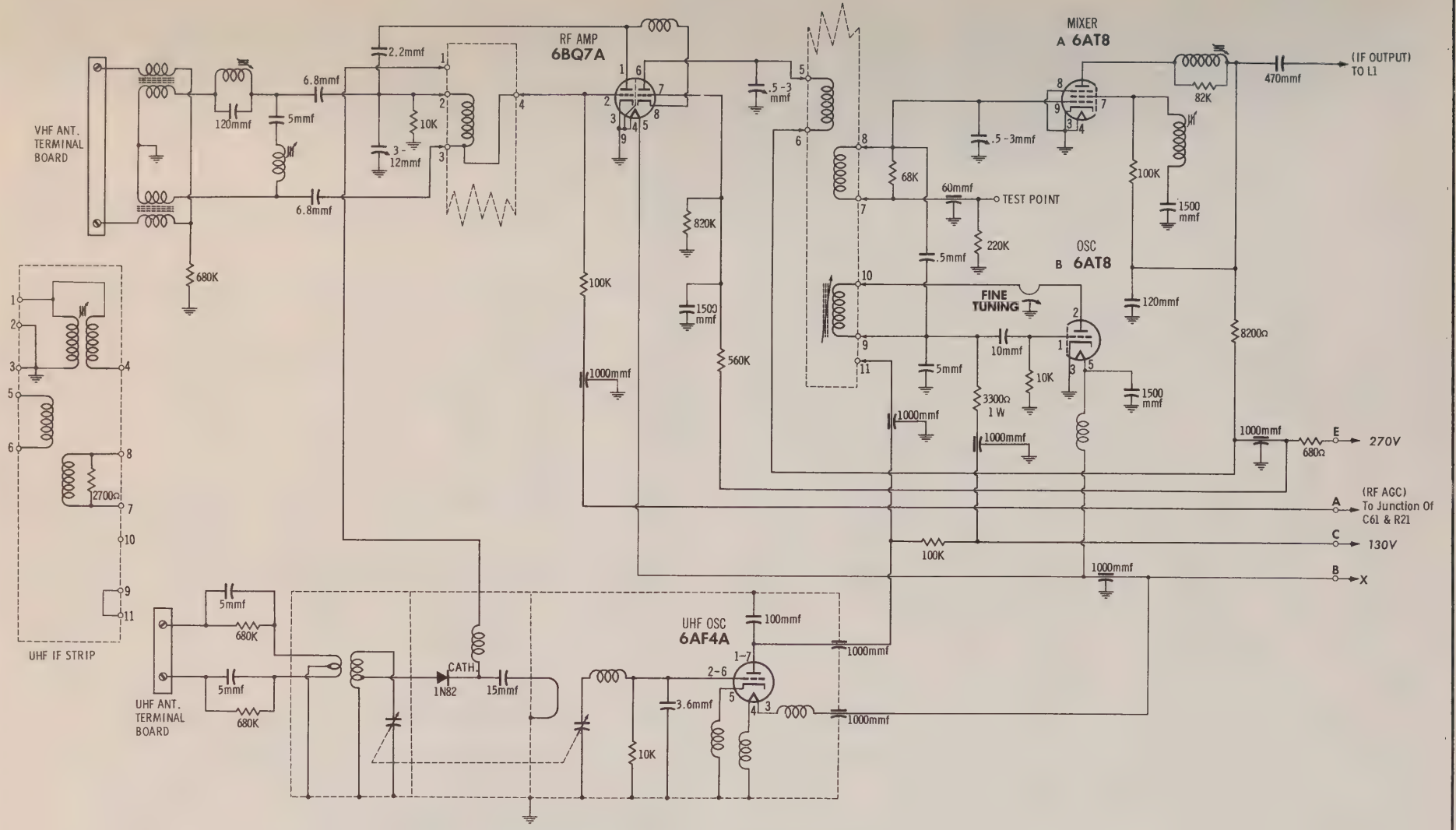
ALTERNATE VHF TUNER SCHEMATIC



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UHF-VHF TUNER PART NO. 10559A

ALTERNATE UHF-VHF TUNER SCHEMATIC

PARTS LIST AND DESCRIPTIONS (Continued)

FUSES

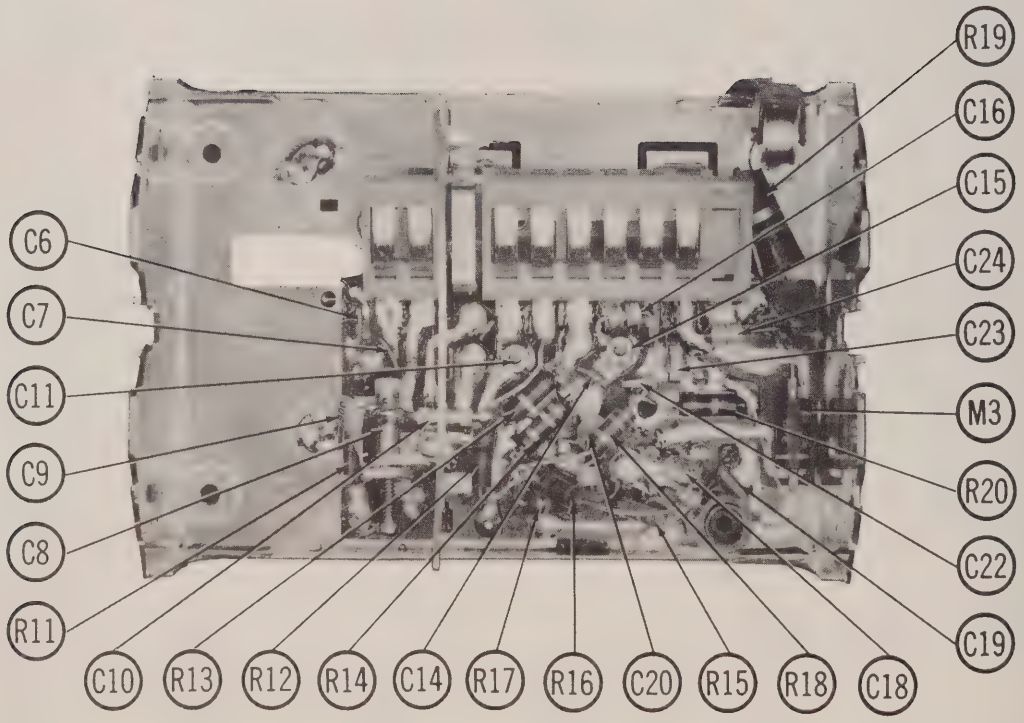
ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			Packard-Bell PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG S/B P/T	1/2A 125V			315. 500		MDV 1/2	
M2	1 1/2"	#26 Wire						

CRYSTAL DIODES

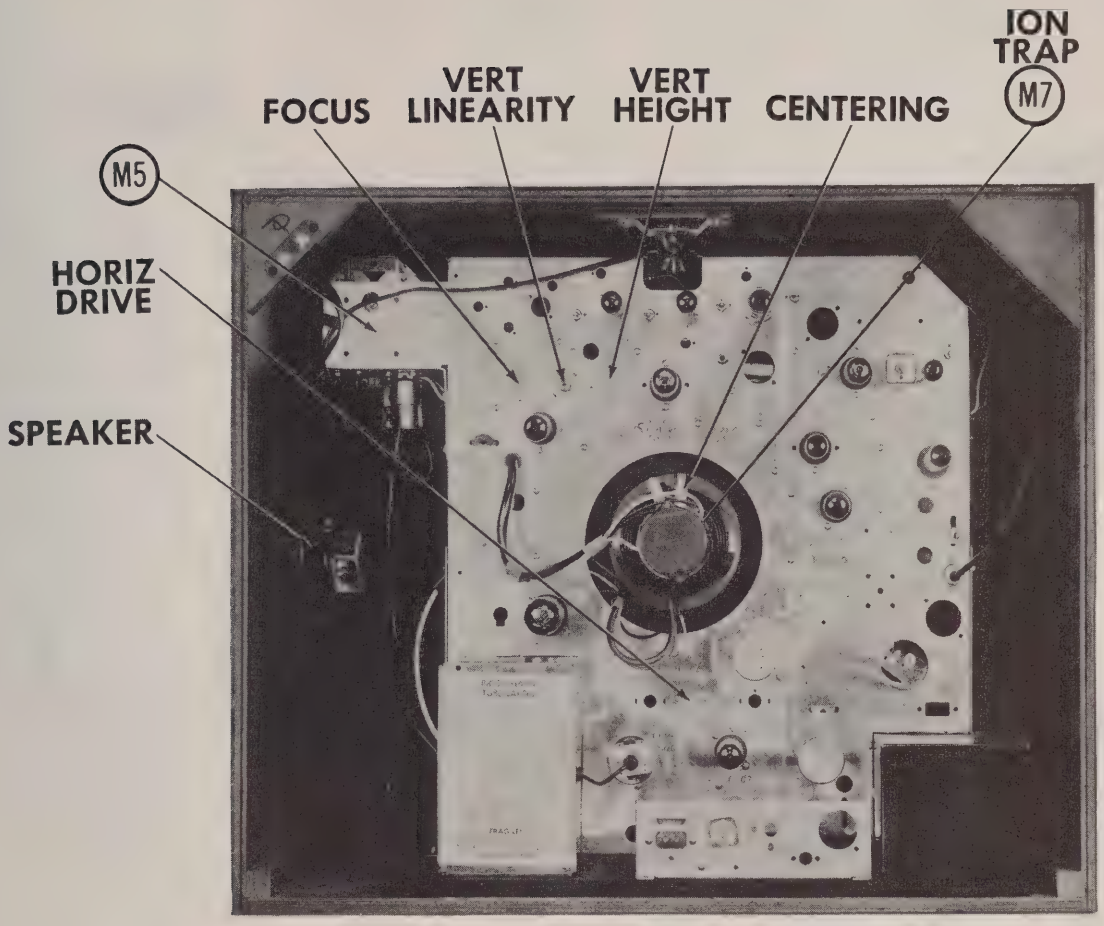
ITEM No.	ORIG. TYPE	REPLACEMENT DATA		NOTES
		Packard-Bell PART No.	SYLVANIA PART No.	
M3	S58		1N34A	Fine Tuning (Pigtail)

MISCELLANEOUS

ITEM No.	PART NAME	Packard-Bell PART No.	NOTES
M4	Dial Lamp		#15
M5	Tuner	10558	VHF
	Tuner	10566-A	VHF, Alternate part number.
M6	Tuner	10559-A	UHF/VHF Tuner
M7	Ion Trap		



RF TUNER BOTTOM VIEW



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably with a test pattern.

Adjust the horizontal hold until the picture synchronizes horizontally. The proper setting for the horizontal hold is half-way between the two points where the picture starts to tear.

Adjust the horizontal drive control (R10) in a clockwise direction as far as possible without the presence of a vertical white line or compression near the center of the screen.

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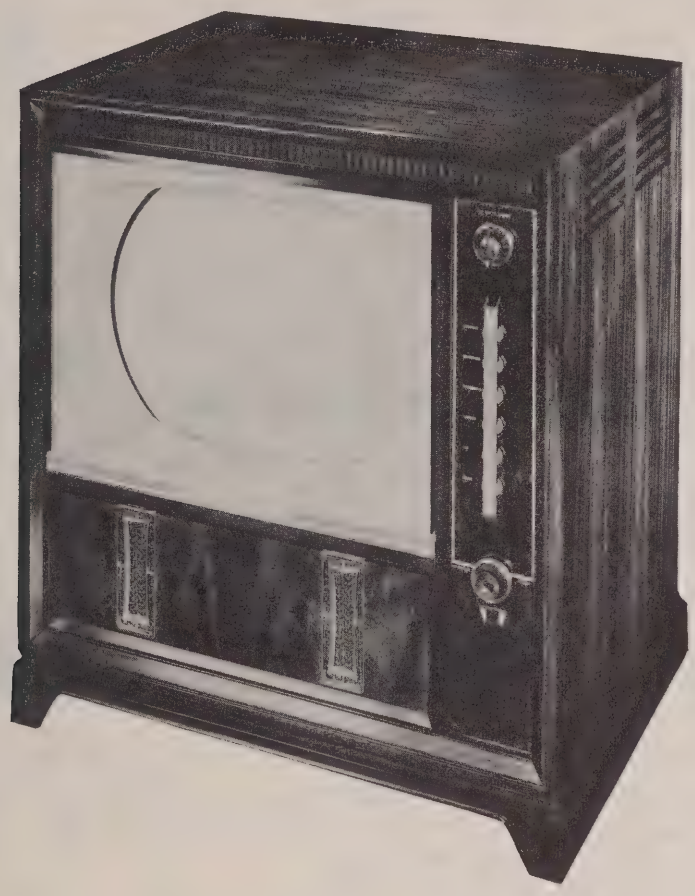

PHILCO MODEL 22D5102M (Ch. TV-123)

TRADE NAME	Philco Models 22D5100, L, 22D5102, L, M (Ch. TV-123)
MANUFACTURER	Philco Corp., Tioga & "C" Streets, Philadelphia, Pa.
TYPE SET	Color Television Receiver
TUBES	Thirty-four
POWER SUPPLY	110-120 Volts AC-60 Cycles RATING 4.2 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)

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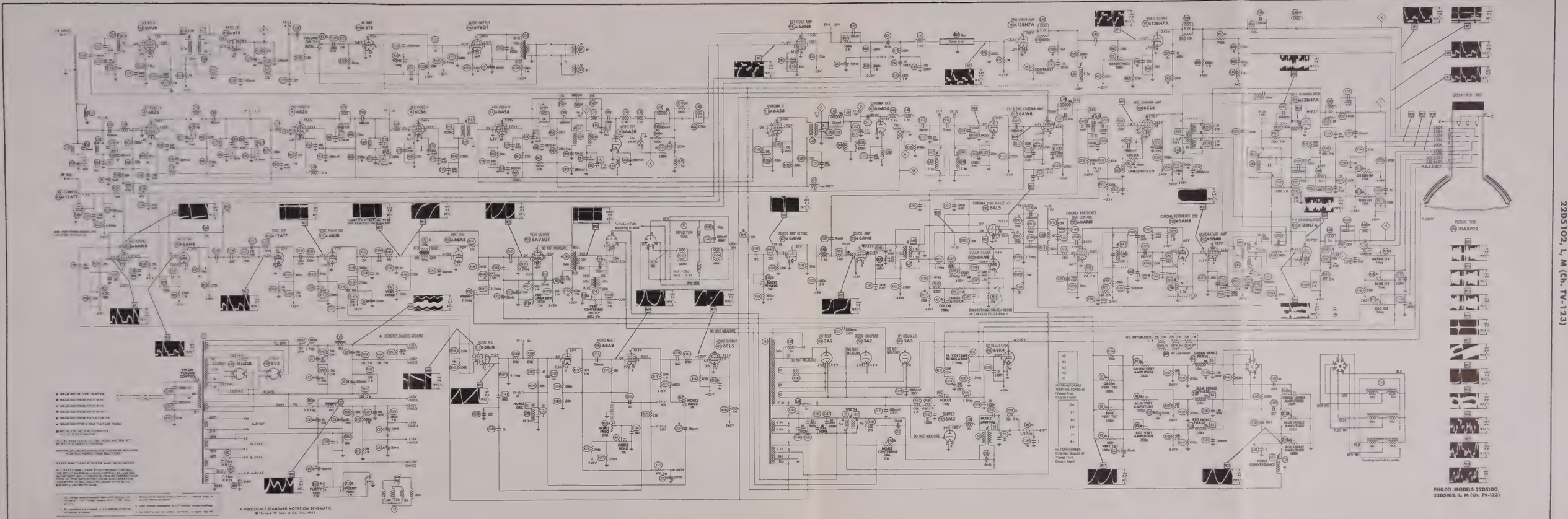

PHILCO MODELS 22DS100, 22DS102, L, M (Ch. TV-123)

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PHILCO MODELS 22D5100, 22D5102, L, M (Ch. TV-123)

BLOCK DIAGRAM

MISCELLANEOUS ADJUSTMENTS

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

1. Set the horizontal hold control to its mid-range position.

2. Connect clip leads from TP14 and TP15 to chassis.

3. Adjust horizontal frequency control R16A until the picture is almost in sync horizontally and just floats back and forth across the screen. Check the amount of deviation from 15750∿ at each extreme setting of the hold control by counting the number of slanted bars present on the screen. Retouch R16A until the deviation is the same at both extreme settings of the horizontal hold control. A tolerance of one bar is acceptable.

4. Remove the clip lead from TP15 and adjust the horizontal oscillator slug (B1) until the oscillator is again at sync frequency. Remove the clip lead from TP14. With the horizontal frequency control and the oscillator coil properly adjusted, the picture should not lose sync at either extreme setting of the horizontal hold control.

5. Connect the vertical amplifier of the scope to TP10 and low side to chassis. Adjust the burst timing control (R16B) until the right hand edge of the burst falls at the right hand edge of the gate pulse as in Fig. 12 with the horizontal hold control turned to full clockwise position. The burst must remain at the top of the gate pulse for any setting of the horizontal hold control. None of the chroma information following the burst must reach the top of the gate pulse for any setting of the horizontal hold control. This adjustment is made only while receiving a signal from a color program transmission.

Adjust width slug (B2) for a picture SLIGHTLY wider than necessary to fill the picture mask horizontally. Adjust horizontal limiter (B3) for best horizontal linearity.

CONVERGENCE COIL

1. Calibrate the scope for 40 volts peak to peak.

2. Unplug the convergence assembly from its socket.

3. Connect the vertical amplifier of the scope to pin 2 of the convergence assembly socket. Connect the low side to chassis.

4. Turn the blue horizontal amplitude control fully clockwise.

5. Adjust A5 until the waveform on the scope is 40 volts peak to peak.

COLOR PURITY

1. Check the following mechanical setups.

   a. The yoke should be placed so that the space between the yoke and picture tube neck is equal all the way around.

   b. The convergence coil and magnet assembly should be positioned directly over the internal pole pieces in the neck of the picture tube. The red, blue and green convergence magnet assemblies should be positioned to line up as closely as possible to exact position of the three guns. The blue magnet is marked with black paint on the screw and should always be at the top of the tube neck.

   The blue lateral magnet assembly should be exactly over the two internal pole pieces with the adjustable magnet directly over the blue gun.

2. a. Using a white dot generator, adjust the red, blue and green convergence magnets to converge the three center dots to form a single white dot.

   b. Adjust the focus control for the sharpest lines over the entire screen.

3. Turn off the green and blue guns using the green G1 control (R13A) & blue G1 control (R13B), leaving only a red field. Set up proper red purity in the following manner.

   a. Adjust all purity magnets around the rim of the picture tube for minimum effect (out position).

   b. Using a magnetic compass, face the set either magnetic east or magnetic west. If faced west, the purity control must be rotated fully counter clockwise. If faced east, the purity control must be rotated fully clockwise.

   c. Rotate the color purity magnet (M18) around the neck of the picture tube for the best red saturation in the center of the screen. Also, adjust the purity magnet pole tabs, individually, for the best red center.

   d. If there are edge impurities, adjust the yoke forward or backward being careful not to tilt the yoke or cause decentering. If the yoke is tilted, it will result in convergence errors.

   e. Adjust purity magnet (M17) to eliminate impurities in the red screen and produce a pure red raster. Turn the brightness control down just past the point where the red gun is cut off. Increase the green G1 control and check field for purity. Turn down the green G1 control and turn up the blue G1 control and check field for purity. It may be necessary to compromise the edge magnets to obtain the best overall red, blue and green fields.

   f. Increase the brightness control to normal and adjust G1 controls on blue and green guns for best white balance. Reset the edge magnets for the best white field but do not sacrifice red, green or blue purity any more than is necessary.

   g. Return the receiver to the desired location and adjust the purity control to give the most uniform white. If necessary to overcome objectionable errors in the white field, the rim purity magnet (M17) may be slightly retouched.

4. Using a white dot generator, again converge the red, green and white dots at the center of the screen to produce a white dot at the center.

AGC CONTROL

1. Tune the receiver to a reasonably stationary signal (preferably a test pattern).

2. Calibrate the scope for 35 volts peak to peak.

3. Connect the vertical amplifier of the scope to TP5. Low side to chassis.

4. Adjust the scope centering control until the sync tips are even with the lower calibration line on the scope screen.

5. Using a clip lead, intermittently short point (A) to chassis while observing the scope. This is to prevent the scope input from charging.

6. Set the AGC control (R22) for a 35 volt difference between sync tips and B+ which is the uppermost point of travel of the scope trace when point (A) is momentarily shorted to chassis.

DYNAMIC CONVERGENCE

1. Set the contrast control to mid-point. Advance the brightness control then lower to the point where the background just becomes black. Using the white dot generator, converge the center dots with the three convergence magnets and blue lateral magnet. (This is static or DC convergence.)

2. a. Turn all three vertical amplitude controls to approximately mid-position.

   b. Adjust the red vertical tilt for even displacement of the center red row of dots with respect to the center vertical row of blue dots.

   c. Adjust green vertical tilt for symmetrical displacement of the center vertical row of dots with respect to the center vertical row of blue dots.

   d. Adjust the blue vertical tilt for even displacement of the vertical center row of blue dots with respect to the vertical center row of red and green dots.

   e. Turn the red and green horizontal amplitude controls fully counter clockwise for MINIMUM effect.

   f. Converge the center dots for a single white dot. Step 2 is to MINIMIZE the effects of interactions.

3. a. Turn off the green gun with the green G1 control.

   b. Adjust the red vertical amplitude and tilt to make the center vertical row of red dots parallel to the center vertical row of blue dots.

   c. Reconverge at the center using the red magnets.

4. a. Adjust the blue vertical amplitude and tilt for equal displacement of the blue dots and in the same direction from the red dots throughout the center vertical row.

   b. Reconverge at the center with the blue magnet. At this point the red and blue dots should be completely converged (within limits) throughout the center vertical row of dots.

5. a. Turn up the green gun with the green G1 control.

   b. Adjust the green vertical amplitude and tilt until the center vertical row of green dots are parallel to the center vertical row of magenta dots (the red and blue dots converged).

   c. Reconverge at the center with the green magnet. The pattern should now be converged along the vertical center line within 3/4 of an inch of the top and bottom of the screen.

6. a. Adjust the blue horizontal amplitude control and blue horiz. phase (B4) to make the center horizontal row of blue dots parallel to the green and red horizontal row of dots.

   b. Reconverge at the center using the blue magnet.

   c. Turn off the blue gun with the blue G1 control.

7. a. Turn the red horizontal amplitude control fully clockwise.

   b. Adjust the red horizontal phase (B5) for equal displacement of the red dots and in the same direction from the green dots throughout the center horizontal row.

   c. Turn the red horizontal amplitude control fully counter clockwise.

8. a. Turn the green horizontal amplitude control fully clockwise.

   b. Adjust green horizontal phase (B6) for equal displacement of the green dots and in the same direction from the red dots throughout the center horizontal row.

   c. Turn the green horizontal amplitude control back fully counter clockwise.

9. a. Turn up the red and green amplitudes simultaneously to obtain equal displacement of the green dots and in the same direction from the red dots along the center horizontal row of dots.

   b. Reconverge at the center using the red and green magnets. The red and green dots should now be converged (within limits) along both the vertical and horizontal center row of dots.

MISCELLANEOUS ADJUSTMENTS (cont.)

10. a. Turn up the blue gun with the blue G1 control.

b. Readjust the blue horizontal amplitude control and blue horizontal phase (B4) to superimpose the blue center horizontal row of dots on the row of yellow dots (converged red and green dots).

c. It may be necessary to readjust the blue lateral correction magnet to obtain symmetrical displacement of the blue dots from the yellow dots along the center horizontal row.

d. The center horizontal and vertical rows of dots should now be converged (within limits). Slight misconvergence at the extreme corners is acceptable.

WHITE BALANCE

1. Calibrate the scope for 65 volts peak to peak.

2. Be sure the AGC has been properly adjusted and set the line voltage to 117 volts.

3. Set the brightness control at mid-position.

4. Connect the vertical amplifier to point (K). Low side to chassis.

5. Turn the receiver to a station with a reasonably stationary picture containing blacks and whites. (A test pattern will suffice.)

6. Adjust the contrast control to provide 65 volts peak to peak of video information (black to white measurement) on the scope.

7. Adjust the brightness control clockwise until the sync tips start to compress and then back off until compression disappears.

8. Set the blue G1 control and green G1 control fully counter clockwise.

9. Set the blue G2 control and green G2 control fully counter clockwise. If necessary, increase red G2 control until a red picture is obtained on the picture tube screen.

10. Adjust the vertical hold control until the blanking bar is approximately midway between the top and bottom of the screen.

11. Adjust the red G2 control until the blanking bar just becomes black.

12. Connect a bar generator to the antenna terminals and set pattern selector switch to the black and white bar position. A test pattern or a reasonably stationary black and white picture may be used if necessary.

13. Adjust the green G1 and G2 controls so that all levels of the bar chart are similar shades of yellow. The G2 control has primary effect over darker parts of the chart and the G1 controls the lighter areas. For example; if the light parts are too green and the darker parts too red, the green G1 control should be turned back and the green G2 control turned up.

14. Adjust the blue G1 control and the blue G2 control for a neutral gray and white in the bar pattern. The same procedure for adjusting the green G1 and G2 controls are used for adjusting the blue. For example; if the dark part of the picture is too blue and the light parts are too yellow, the blue G2 control should be turned down and the blue G1 advanced.

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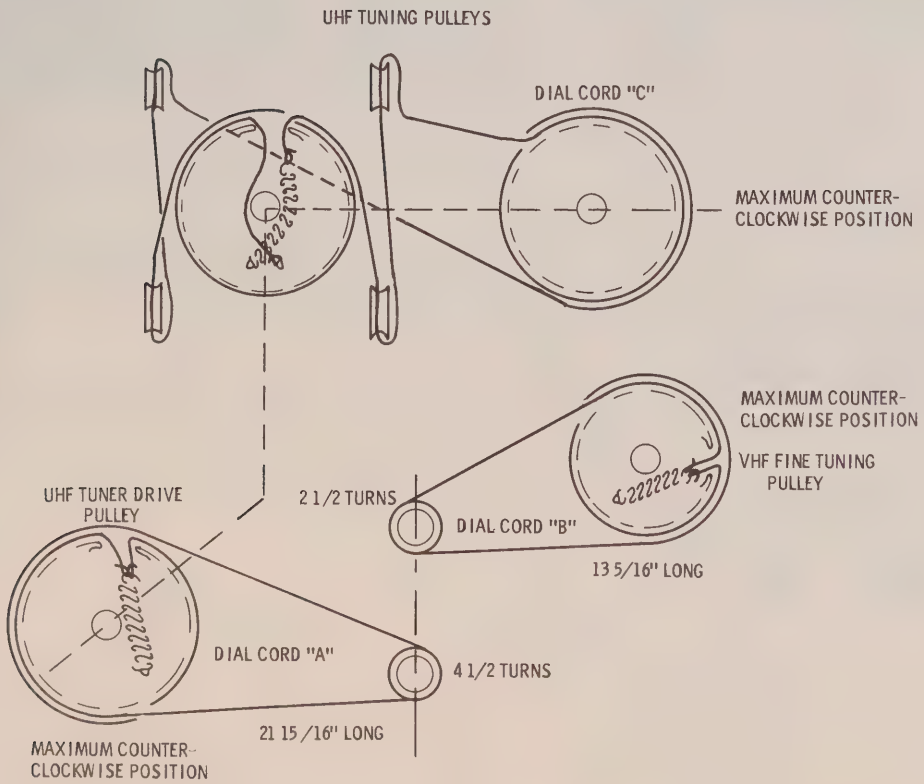


UHF VHF DRIVE CORD

SET 349 FOLDER 9

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Disable the high voltage, by removing the horizontal output tube (V2) from its socket

VIDEO IF ALIGNMENT

Connect the negative lead of a 35 volt bias supply to point Ⓓ. Positive to chassis.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Fig. 1	Across UHF antenna terminals thru matching network (Fig. 1).	41.25MC (400~ 30% AM Mod.)	UHF	Vert. Amp. thru 10K to point Ⓐ. Low side to chassis.	A1	Adjust for MINIMUM indication on scope.
2.	"	"	47.25MC	"	"	A3	"
3.	"	"	41.25MC	"	Vert. Amp. thru 10K to point Ⓑ. Low side to chassis.	A5, A4	Preset A4[illegible] slug one inch from chassis. Adjust for [illegible] indication on scope.
4.	"	"	47.25MC	"	"	A5, A6	Adjust for MINIMUM indication on scope.
5.	"	"	39.5MC	"	"	A7	"
6.	"	"	47.0MC	"	"	A8	"
7.	"	"	43.0MC	"	"	A9	Adjust for maximum indication on scope.
8.	"	"	45.75MC	"	"	A10	"
9.	"	"	43.0MC	"	"	A11	"
10.	"	"	44.75MC	"	"	A13	"
11.	"	"	44.75MC	"	"	A13	Insert 680Ω from point Ⓒ to chassis. Adjust for maximum indication on scope.
12.	"	"	44.0MC	"	"	A14	Insert 680Ω from point Ⓒ to chassis. Adjust for maximum indication on scope.
13.	"	"	44.25MC	"	Vert. Amp. thru 10K to point Ⓒ. Low side to chassis.	A15, A16	Insert 560Ω from point Ⓒ to chassis. Adjust for maximum indication on scope.

OVERALL VIDEO IF RESPONSE CHECK

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
14.	Fig. 1	Across antenna terminals thru matching network (Fig. 1).	Not used	65.75MC (400~ 30% AM Mod)	4	Vert. Amp. thru 10K to point Ⓐ. Low side to chassis.	Fine tuning	Adjust fine tuning for MINIMUM indication on scope. Leave fine tuning in this position for remainder of video IF alignment
15.	"	"	69MC (10MC Swp)	41.65MC 42.5MC 43.56MC	"	Vert. Amp. thru detector (Fig. 3) to point Ⓒ. Low side to chassis.	A9, A10, A11, A13	Touch-up A8 thru A13 to obtain response similar to Fig. 3 with markers as indicated. A10 adjusts high frequency side of curve, A9 and A11 adjusts the low frequency side and A13 adjusts tilt.
16.	"	"	"	"	"	Vert. Amp. to point Ⓐ. Low side to chassis.		Adjust A15 and A16 if necessary to shape corners of curve. It may be necessary to retouch A13 to correct tilt. Adjust A3 to place 45.75MC marker at approximately 50% as in Fig. 4.
17.	"	"	"	"	"	Vert. Amp. to point Ⓑ. Low side to chassis.	A16, A13, A14	Touch-up A13 and A14 to obtain response similar to Fig. 5. Retouch A5 for proper placement of 45.75MC marker.

SOUND IF ALIGNMENT

Turn the set on and tune in a TV station.
Connect the negative lead of a variable bias to point Ⓔ. Connect positive to chassis. Adjust bias for -5 to -10 volts.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
18.	Direct	Antenna to antenna terminals.	Not used	Any channel operating	DC probe thru detector (Fig. 6) to point Ⓔ. Common to chassis	A17, A18, A19	Adjust A17 and A18 for maximum indication on meter. Adjust A19 for maximum volume in sound.

VHF OSCILLATOR ALIGNMENT

Connect bias as under "Video IF Alignment"
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control to the mid-position of its range.
Adjustments are located on front of the tuner (See Fig. 7).

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
19.	Direct	Across antenna terminals.	208.75MC	13	Vert. Amp. thru 10K to point Ⓐ. Low side to chassis.	A30	Adjust for MINIMUM indication on scope.
20.	"	"	203.75MC	12	"	A31	"
21.	"	"	197.75MC	11	"	A33	"
22.	"	"	191.75MC	10	"	A33	"
23.	"	"	185.75MC	9	"	A34	"
24.	"	"	179.75MC	8	"	A35	"
25.	"	"	175.75MC	7	"	A36	"
26.	"	"	81.75MC	6	"	A37	"
27.	"	"	75.75MC	5	"	A38	"
28.	"	"	69.75MC	4	"	A39	"
29.	"	"	59.75MC	3	"	A40	"
30.	"	"	53.75MC	2	"	A41	"

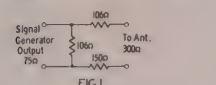


FIG. 1

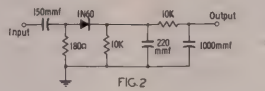


FIG. 2

FIG. 3

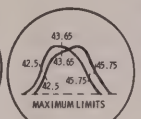


FIG. 4

FIG. 5

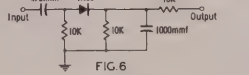
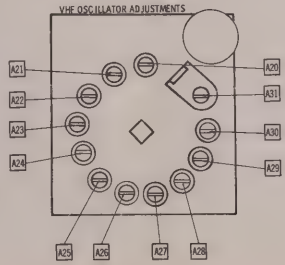


FIG. 6



VHF RF AND MIXER ALIGNMENT

Connect the negative lead of a variable bias to point Ⓓ. Positive to chassis. Adjust bias to produce -1.5 volts of bias at pin 1 of AGC clamper (V16A).
Disconnect the orange B+ lead from the tuner and connect a 3300Ω, 2 watt carbon resistor in series with the lead and connect the resistor to the tuner B+ connection. Connect the vertical amplifier lead of the scope to the tuner side of the 3300Ω resistor and the ground lead to chassis.
In some cases it may be necessary to connect approximately 50MFD from the B+ side of the resistor to chassis to help stabilize the waveform on the scope. Disconnect the chassis end of the tuner link lead and connect a 68Ω carbon resistor from the open end of the link to ground.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
Use only enough sweep generator output to provide usable pattern on scope.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
31.	Fig. 1	Across VHF antenna terminals thru matching network.	[illegible] (10MC Swp)	211.25MC 215.75MC	13	See instructions.	A32	Adjust for response similar to Fig. 8 with markers as indicated.
32.	"	"	"	"	13	"	A33, A34	Adjust A33 and A34 alternately to obtain maximum symmetrical response similar to Fig. 8. A33 adjusts gain and A34 adjusts tilt.
33.	"	"	177MC (20MC Swp)	175.25MC 179.75MC	7	"	A35, A36	Adjust for response similar to Fig. 8 with markers as indicated. Repeat step 33, then 33 until desired response is obtained on channels 7 and 13.
34.	"	"	85MC (10MC Swp)	83.25MC 87.75MC	6	"	A37	Adjust counter clockwise until single peak appears. Do not unscrew core to far out or it will drop out of coil.
35.	"	"	"	85MC	"	"	A38	Adjust to place 85MC marker at peak of response.
36.	"	"	"	"	"	"	A39	Adjust for maximum gain and symmetry of single peak.
37.	"	"	"	"	"	"		Retouch A37 and A38 for symmetrical response centered about 85MC marker.
38.	"	Across UHF antenna terminals thru network (Fig. 1).	43.5MC (10MC Swp)	Not used	UHF	"	A40	Adjust for flat response.

CHROMA IF ALIGNMENT

Sound take-off coil (A18) must be properly adjusted before starting "Chroma IF Alignment" to prevent a notch in the chroma response.
Connect the negative lead of a 35 volt bias supply to point Ⓓ. Positive to chassis.
Turn chroma control counter clockwise 1/8 of its rotation range from full clockwise
Remove the chroma reference oscillator (V26) from its socket.
Connect an .01MFD capacitor from TP-35 to chassis. Connect an .01MFD capacitor from TP-34 to chassis. Connect an .01MFD capacitor from TP-37 to chassis. Connect a lead from TP-33 to chassis.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
39.	10K Carbon Resistor	High side to point Ⓕ thru 10K. Low side to chassis.	Not used	3.15MC (30% 400~ AM Mod)	Any Unused Channel	Vert. Amp. thru detector to point Ⓓ. (Fig. 6). Low side to chassis.	A42	Connect a 1000Ω resistor from TP-9 to chassis while adjusting A42 for maximum indication on scope. Remove resistor.
40.	"	"	"	3.75MC	"	"	A43	Connect 1000Ω resistor from TP-10 to chassis, while adjusting A43 for maximum scope indication. Remove resistor.
41.	"	"	"	4.95MC	"	"	A43	Adjust for MINIMUM indication.
42.	"	"	"	2.95MC	"	"	A44	Adjust for maximum indication.
43.	"	"	"	3.56MC	"	"	A45	"
44.	"	"	3.6MC (3MC Swp)	2.95MC 4.1MC	"	"		Retouch A42 and A44 for response similar to Fig. 9 with markers as indicated and flat top. Retouch A43 to correct shape of curve at 2.95MC marker. A45 is used to correct tilt of overall curve. Do not turn A45 more than 1/4 turn.

FIG. 8

FIG. 9

PHILCO MODELS 22D5100, 22D5102, L, M (Ch. TV-123)

ALIGNMENT INSTRUCTIONS (cont)

CHROMA SYNC PHASE DETECTOR, CHROMA REFERENCE OSCILLATOR AND DEMODULATOR ALIGNMENT

Replace the horizontal output tube (V21) in its socket.

1. Connect a color bar generator to the antenna terminals and set the selector for color bars.
2. Adjust the receiver for normal reception of the color bars and then set the "Hue" control (M20) at mid-range.
3. Burst alignment.
   a. Connect the VTVM to TP-21 and chassis for a negative voltage reading.
   b. Adjust A46 for maximum negative voltage on the VTVM.
4. Oscillator Drive.
   a. Turn A47 seven turns in from full counter clockwise position.
   b. Using the low capacity probe (Fig. 10). Connect the positive lead of the VTVM to pin 7 (grid) of V18. Connect negative lead to chassis.
   c. Starting full counter clockwise position of A48 adjust clockwise until 1.75 volt (±.25 volts is obtained on VTVM. Remove the low capacity probe.
5. Oscillator Frequency.
   a. Connect a clip lead from TP-18 to chassis.
   b. Connect a clip lead from TP-12 to chassis.
   c. Adjust A47 until the color in the bar pattern stops running and becomes as nearly stationary as possible. Remove the clip lead from TP-12.
6. Quadrature Amplifier.
   a. Connect the VTVM to TP-21 for a negative voltage reading.
   b. Adjust A49 for maximum negative DC voltage on the VTVM.
   c. Remove the clip lead from TP-18 and chassis.
7. Master Phasing.
   a. Check the setting of the "Hue" control (M20). It should be at mid-range.
   b. Connect the vertical amplifier of the scope to point ⟨H⟩. Connect low side to chassis.
   c. Retouch A46 until the color bar waveform on the scope appears in their proper ratios as in Fig. 11, B-Y.
8. Quadrature.
   a. Connect the vertical amplifier of the scope to point ⟨J⟩. Positive to chassis.
   b. Adjust A50 until the color bar waveform on the scope appears in their proper ratios as in Fig. 11, R-Y.
9. Phase Detector Balance Check.
   a. Connect the DC probe of the VTVM to TP-22. Common to chassis. The voltage reading on the VTVM with the burst being received should not exceed ±.5 volts. If a greater voltage is indicated on the meter, the circuit components and the chroma sync phase detector tube (V28) should be checked.
   b. After completing the alignment, the voltage at TP-22 should be checked without a signal being received. This noise balance check should not exceed ±.8 volts. If the voltage is higher than this amount, the circuit and components should be checked.

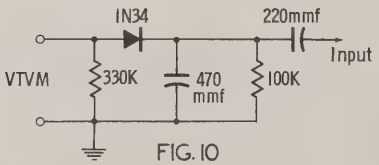


FIG. 10

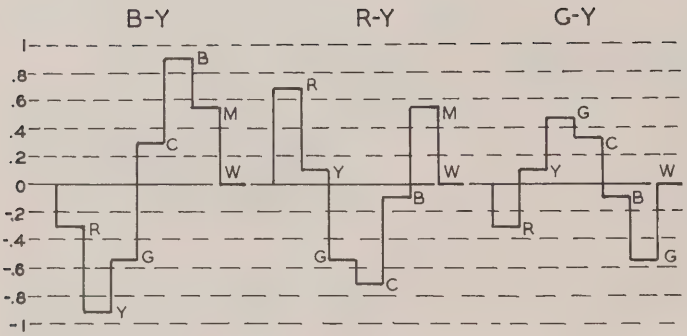


FIG. 11

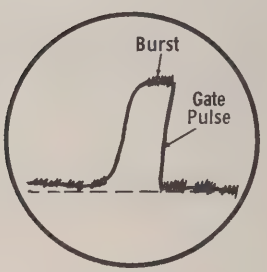
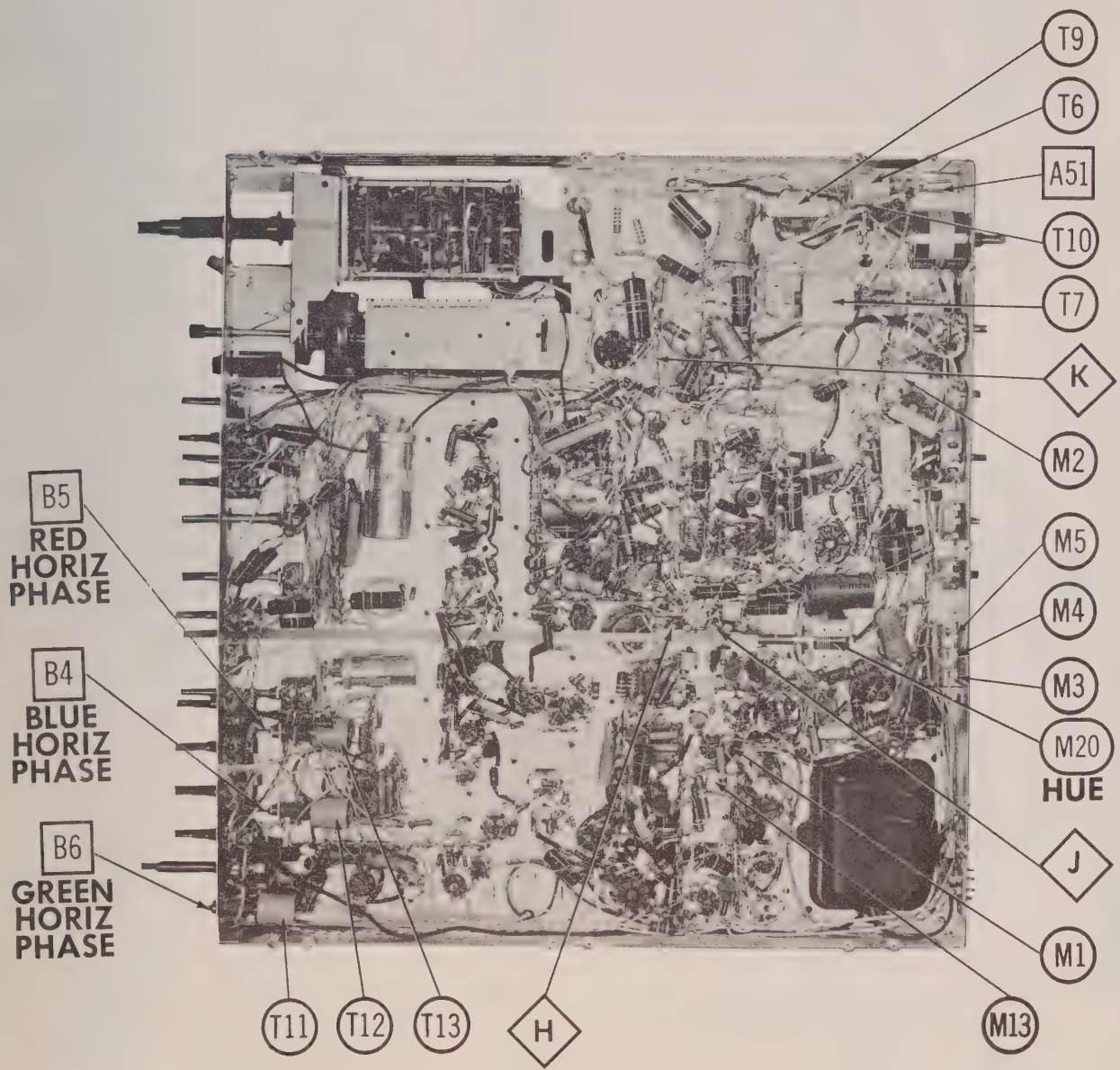
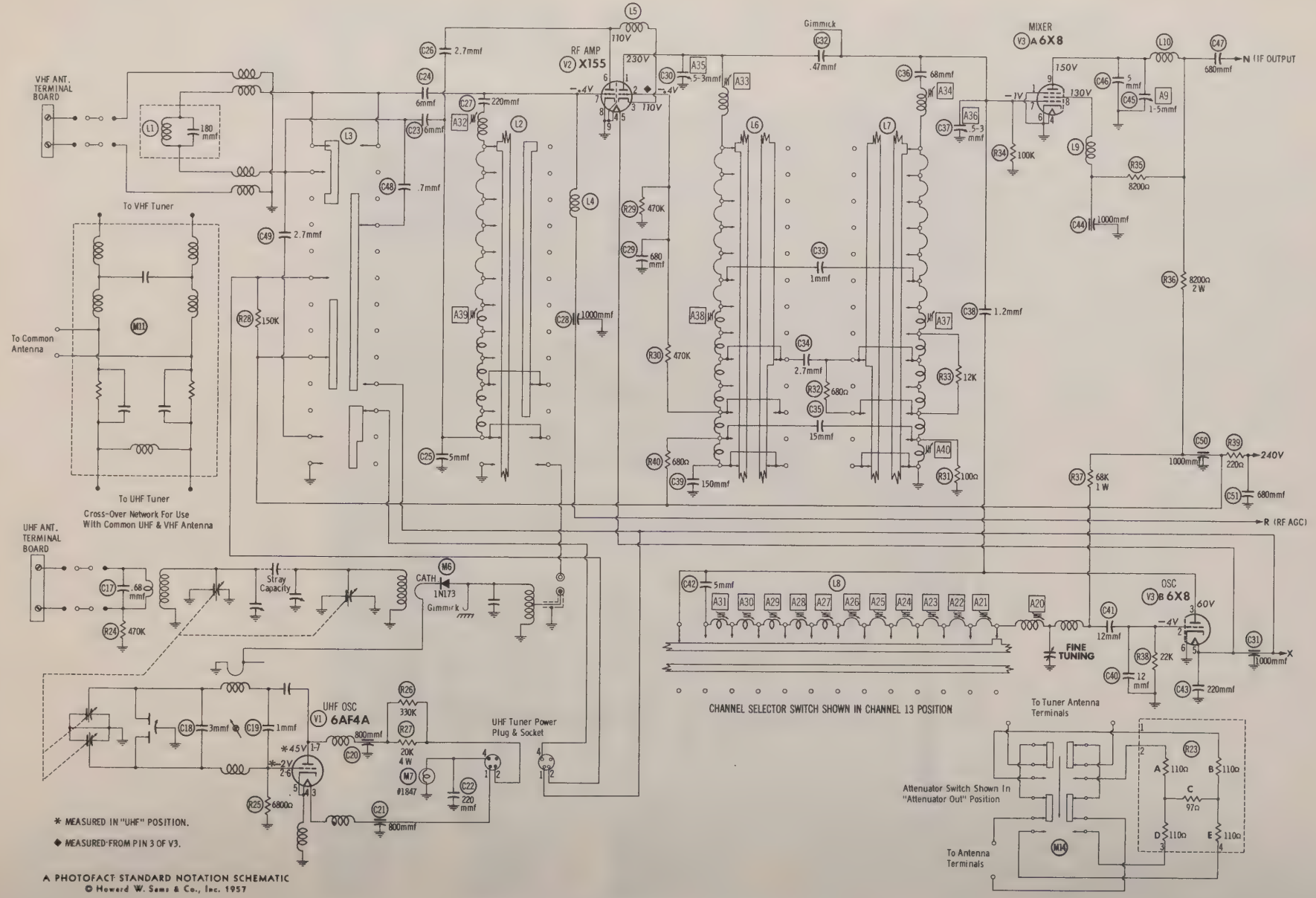


FIG. 12



CHASSIS BOTTOM VIEW INDUCTOR & ALIGN. IDENT.


VHF ANT. TERMINAL BOARD
To VHF Tuner
To UHF Tuner
Cross-Over Network For Use With Common UHF & VHF Antenna
To Common Antenna
UHF ANT. TERMINAL BOARD
RF AMP V2 X155
MIXER V3A 6X8
OSC V3B 6X8
UHF OSC V1 6AF4A
Gimmick
Stray Capacity
CATH
1N173
FINE TUNING
CHANNEL SELECTOR SWITCH SHOWN IN CHANNEL 13 POSITION
UHF Tuner Power Plug & Socket
To Tuner Antenna Terminals
Attenuator Switch Shown In "Attenuator Out" Position
To Antenna Terminals
N (IF OUTPUT
R (RF AGC)
* MEASURED IN "UHF" POSITION.
◆ MEASURED FROM PIN 3 OF V3.
A PHOTOFACT STANDARD NOTATION SCHEMATIC
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UHF-VHF TUNER SCHEMATIC

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE St.,
DENVER, COLORADO

CHASSIS BOTTOM VIEW CAPACITOR IDENT. (C1-C104)

PHILCO MODELS 22D5100, 22D5102, L, M (Ch. TV-123)

PHILCO MODELS 22D5100, 22D5102, L, M (Ch. TV-123)

CHASSIS BOTTOM VIEW RESISTOR IDENT. (R131-R287)

PHILCO MODELS 22D5100, 22D5102, L, M (Ch. TV-123)

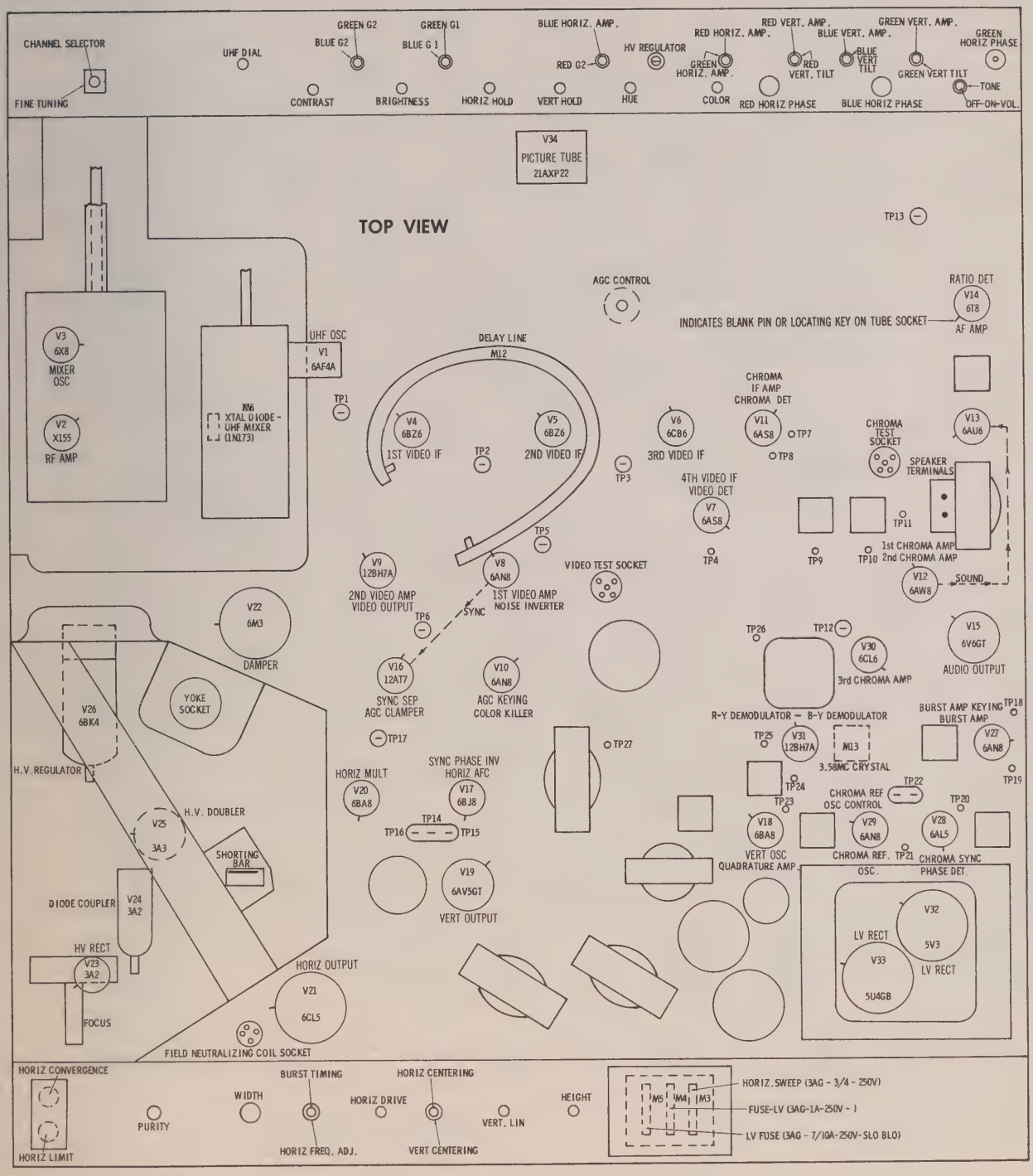
CHASSIS BOTTOM VIEW RESISTOR IDENT. (R1-R130)

PHILCO MODELS 22D5100, 22D5102, L, M (Ch. TV-123)

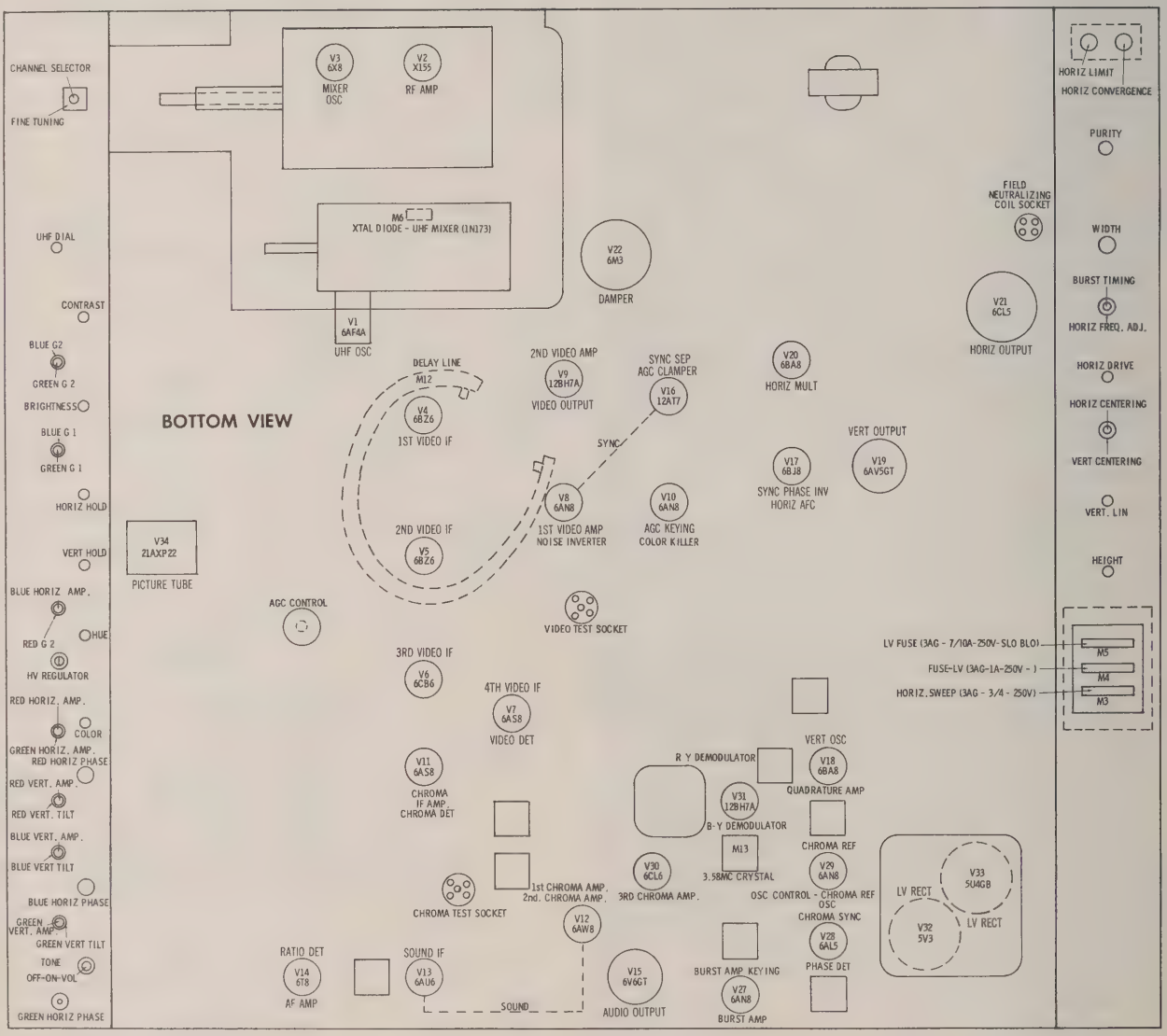
CHASSIS BOTTOM VIEW CAPACITOR IDENT. (C105-C237)

TUBE PLACEMENT CHART

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.



PHILCO MODELS 22D5100, 22D5102, L, M (Ch. TV-123)



TUBE PLACEMENT CHART

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

RESISTANCE MEASUREMENTS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6AF4A	*20K	6800Ω	.1Ω	0Ω	0Ω	6800Ω	*20K		
V2	X155	¶900Ω	220K	INF	0Ω	.1Ω	INF	900K	0Ω	0Ω
V3	6X8	0Ω	22K	¶68K	0Ω	.1Ω	0Ω	100K	¶17K	8.5K
V4	6BZ6	65K	47Ω	.1Ω	0Ω	¶11.6K	¶11.4K	0Ω		
V5	6BZ6	65K	47Ω	.1Ω	0Ω	¶11.6K	¶11.4K	0Ω		
V6	6CB6	1000Ω	150Ω	.1Ω	0Ω	¶9.9K	¶9.9K	0Ω		
V7	6AS8	6000Ω	.1Ω	330Ω	.1Ω	0Ω	2200Ω	0Ω	0Ω	500Ω
V8	6AN8	†240K	¶8300Ω	¶3000Ω	.1Ω	0Ω	¶8200Ω	¶3600	2200Ω	82Ω
V9	12BH7	†5000Ω	100K	56Ω	0Ω	0Ω	¶4400Ω	1800Ω	●7Ω	.1Ω
V10	6AN8	100K	†2Meg	10K	†40K	†40K	¶470K	†22K	†138K	¶1000Ω
V11	6AS8	¶6000Ω	.1Ω	330Ω	.1Ω	0Ω	4700Ω	0Ω	0Ω	¶350Ω
V12	6AW8	220Ω	2.3Ω	¶2500Ω	.1Ω	0Ω	220Ω	†1.4Meg	¶6300Ω	¶3800Ω
V13	6AU6	56K	0Ω	.1Ω	0Ω	¶11K	¶11K	330Ω		
V14	6T8	INF	22K	INF	.1Ω	0Ω	NC	0Ω	10Meg	†330K
V15	6V6GT	NC	0Ω	¶1500Ω	¶1000Ω	520K	TP	.1Ω	180Ω	
V16	12AT7	¶950K	¶950K	0Ω	0Ω	0Ω	¶10K	¶12Meg	0Ω	.1Ω
V17	6BJ8	4.7Meg	150K	4.7Meg	.1Ω	0Ω	150K	¶33K	470K	2200Ω
V18	6BA8	0Ω	●430K	●‡2.7Meg	.1Ω	0Ω	180Ω	1Ω	¶15K	¶3400Ω
V19	6AV5GT	2.2Meg	0Ω	●1200Ω	NC	†1700Ω	TP	.1Ω	¶68K	
V20	6BA8	1150Ω	5.5Meg	¶90K	†40K	†40K	150Ω	●160K	¶55K	†100K
V21	6CL5	¶6000Ω	0Ω	120Ω	470K	470K	120Ω	.1Ω	¶6000Ω	TOP CAP ‡133Ω
V22	6M3	NC	0Ω	†110Ω	NC	†110Ω	NC	†110Ω	.1Ω	TOP CAP 2.7Meg
V23	3A2	20Meg	20Meg	NC	20Meg	20Meg	20Meg	NC	20Meg	20Meg — TOP CAP ‡11.3Ω
V24	3A2	PINS 1 THRU 9 HAVE INF RESISTANCE								TOP CAP 20Meg
V25	3A3	PINS 1 THRU 9 HAVE INF RESISTANCE								TOP CAP INF
V26	6BK4	†75Ω	†75Ω	NC	NC	●1Meg	NC	†75Ω	NC	TOP CAP INF
V27	6AN8	¶7500Ω	●27K	0Ω	.1Ω	0Ω	†1200Ω	†1200Ω	¶7500Ω	¶1400Ω
V28	6AL5	1.5Ω	1.5Ω	.1Ω	0Ω	1.5Meg	0Ω	2Meg		
V29	6AN8	¶80K	150K	2Ω	.1Ω	0Ω	¶1200Ω	¶9000Ω	2Meg	390Ω
V30	6CL6	●1600Ω	120K	¶3900Ω	.1Ω	0Ω	¶1500Ω	0Ω	¶3900Ω	NC
V31	12BH7A	†35K	12K	10K	0Ω	0Ω	†22K	12K	10K	.1Ω
V32	5V3	NC	6000Ω	NC	96Ω	NC	96Ω	NC	6000Ω	
V33	5U4GB	NC	4600Ω	NC	90Ω	NC	90Ω	NC	4600Ω	
V34	21AXP22	40K	†100K	900K 1.8Meg	†8300Ω	¶8300Ω	†240K	¶300K 1.5Meg	NC	●¶8Meg
		PIN 10 NC	PIN 11 300K ¶1.5Meg	PIN 12 †270K	PIN 13 ¶5600Ω	PIN 14 40K				

¶ MEASURED FROM PIN 8 OF V33.
† MEASURED FROM PIN 8 OF V32.
● THIS READING WILL VARY, CONTROL SET FOR NORMAL OPERATION.
* MEASURED IN UHF POSITION.
‡ MEASURED FROM TOP CAP OF V22.

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	UHF Osc.	6AF4A	
V2	RF Amp.	X155	
V3	Mixer-Osc.	6X8	
V4	1st Video IF Amp.	6BZ6	
V5	2nd Video IF Amp.	6BZ6	
V6	3rd Video IF Amp.	6CB6	
V7	4th Video IF Amp. - Video Det.	6AS8	
V8	1st Video Amp. - Noise Inverter	6AN8	
V9	2nd Video Amp. - Video Output	12BH7A	
V10	AGC Keying- Color Killer	6AN8	
V11	Chroma IF Amp. - Chroma Det.	6AS8	
V12	1st Chroma Amp. - 2nd Chroma Amp.	6AW8	
V13	Sound IF Amp.	6AU6	
V14	Ratio Det. -AF Amp.	6T8	
V15	Audio Output	6V6GT	
V16	Sync Sep. -AGC Clamper	12AT7	

ITEM No.	USE	TYPE	NOTES
V17	Sync Phase Inverter- Horiz. AFC	6BJ8	
V18	Vert. Osc. -Quadrature Amp.	6BA8	
V19	Vert. Output	6AV5GT	
V20	Horiz. Mult.	6BA8	
V21	Horiz. Output	6CL5	
V22	Damper	6M3	
V23	HV Rectifier	3A2	
V24	HV Diode Coupler	3A2	
V25	HV Doubler	3A3	
V26	HV Regulator	6BK4	
V27	Burst Amp. Keying- Burst Amp.	6AN8	
V28	Chroma Sync		
V29	Chroma Ref. Osc. Control- Chroma Ref. Osc.	6AN8	
V30	3rd Chroma Amp.	6CL6	
V31	R-Y Demodulator - B-Y Demodulator	12BH7A	
V32	LV Rectifier	5V3	
V33	LV Rectifier	5U4GB	

PICTURE TUBE

ITEM No.	REPLACEMENT DATA				NOTES
	PHILCO PART No.	CBS PART No.	GENERAL ELECTRIC PART No.	SYLVANIA PART No.	
V34	21AXP22			21AXP22 21AXP22A	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	PHILCO PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1	80	300	30-2568-66	AFH1-35	XA0331	FP128	TMS-39	S-185	TVL-1573
C2A	▲80	300	30-2568-69	AFHS-35-50		FP227.7		Q-225	R2333 *
B	▲200	300				TC80		S-195	
C3	200	300	30-2568-67	AFHS1-37-30	CO200	FP227.7		S-200	TVL-2641
C4A	▲40	350	30-2568-68	AFH3-112-60	CO350	FP330.23		Q-220	R2332 *
B	■80	350			BR5005			S-060	
C	▲400	50							
C5A	■20	350	30-2584-64	AFH4-04	CO310	FP377.6	TMT-42	T-540	TVL-4635
B	▲60	350							
C	▲10	350							
C6A	▲40	350	30-2584-63	AFH4-20-50	DO910	FP464.9		Q-467	R2334 *
B	10	350				TC60		T-135	
C	▲40	475							
D	■10	475							
C7	4	450	30-2417-53	PRS450V4	BR445	TC70	TD-4-450	FM-4504	TVA-1702
C8	2	50	45-3035-4	PRS50V2	BBR2-50	TC302	TD-2-50	MT-0502	TVA-1301
C9	2	50	45-3035-4	PRS50V2	BBR2-50	TC302	TD-2-50	MT-0502	TVA-1301
C10	2	50	45-3035-4	PRS50V2	BBR2-50	TC302	TD-2-50	MT-0502	TVA-1301
C11	20	350	30-2417-44	PRS450V20	BR2035	TC65	TD-20-350	FM-4520	TVA-1608
C12	25	50	30-2417-30	PRS50V25	BBR25-50	TC36	TD-25-50	FM-0525	TVA-1306
C13A	5	50	30-2590-2	AFH3-06	BBRD2215	FP211		MTD-1520	TVL-3435
B	▲25	50			BBR5-50	TC30		MMT-0505	
C	■25	50							
C14	500	10	30-2417-51 (Note 1)	NP-PRS10 - VNP500	BRH1510 † BRH1510 †	TC412			R2243 *
C15	10	25	30-2417-49	PRS25V10	BBR10-25	TC22	TD-10-25	FM-0210	TVA-1204
C16	10	25	30-2417-49	PRS25V10	BBR10-25	TC22	TD-10-25	FM-0210	TVA-1204

Note 1. Non-polarized unit.
† Connect negative leads together.
* Non-catalog item.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	PHILCO PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C17	.68				TCZ-R68		TCO-.68			
C18	3									
C19	1									
C20	800									
C21	800									
C22	220		62-122001001	SI220	D6-221	LT6T22	GP-220	UC-5322	5GA-T22	
C23	6		30-1224-9							
C24	6		30-1224-9							
C25	5		30-1224-78	NP0-SI5	TCZ-4R7	LT6V5	TCO-5	ZT-555	5TCCB-V47	
C26	2.7		30-1221-18							
C27	220		62-122001001	SI 220	D6-221	LT6T22	GP-220	UC-5322	5GA-T22	
C28	1000		32-1245-6							
C29	680		62-168001011	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C30	.5-3		31-6520-3		829-3		3115-D	CT565A		
C31	1000		30-1245-6							
C32	.47		30-1221-15							
C33	1		30-1221-19	NP0-SI 1	TCZ-1		TCO-1		5TCCB-V1	
C34	2.7		30-1221-18							
C35	15		62-015300001	NP0-SI 15	TCZ-15	LTQ15	TCO-15			
C36	68		62-068409011							
C37	.5-3		31-6520-3		829-3		3115-D	CT565A	5TCC-Q15	
C38	1.2		30-1224-70							
C39	150		30-1238-9	DI-00015	DD-151	LT10T15	ED-150	UC-5315	5GA-T15	
C40	12		30-1224-119							
C41	12		30-1224-119							
C42	5		30-1221-13	NP0-SI 5	TCZ-4R7		TCO-5	ZT-555	5TCCB-V47	
C43	220		62-122001001	SI 220	D6-221	LT6T22	GP-220	UC-5322	5GA-T22	
C44	1000		30-1245-6							
C45	1-5		31-6520-10							
C46	5		30-1224-28	NP0-SI 5	TCZ-4R7	LT6V5	TCO-5	ZT-555	5TCCB-V47	

PARTS LIST AND DESCRIPTIONS (Continued)

CAPACITORS (cont)

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA PHILCO PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C47	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C48	2.7		30-1224-125							
C49	2.7		30-1224-125							
C50	1000		30-1245-6							
C51	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C52	.5-3		31-6520-12		829-3		3115-D	CT565A		
C53	2	500	30-1256	NP0-SI 2.2	TCZ-2R2	22R5V2	TCO-2.2		5TCCB-V22	
C54	.5-3		31-6520-12		829-3		3115-D	CT565A		
C55	470		62-14700101l	SI 470	D6-471	LT6T47	GP-470	UC-5347	5GA-T47	
C56	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C57	1-5		31-6520-9		829-6					
C58	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C59	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C60	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C61	2	500	30-1256	NP0-SI 2.2	TCZ-2R2	22R5V2	TCO-2.2		5TCCB-V22	
C62	2	500	30-1256	NP0-SI 2.2	TCZ-2R2	22R5V2	TCO-2.2		5TCCB-V22	
C63	.5-3		31-6520-12		829-3		3115-D	CT565A		
C64	.5-3		31-6520-12		829-3		3115-D	CT565A		
C65	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C66	1-5		31-6520-9		829-6					
C67	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C68	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C69	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C70	3.3		30-1224-103	NP0-SI 3.3	TCZ-3R3	CTA6V33C	TCO-3.3	ZT-5533	5TCCB-V33	
C71	.5-3		31-6520-12		829-3		3115-D	CT565A		
C72	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C73	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C74	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C75	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C76	1-5		31-6520-9		829-6					
C77	330		62-13300100l	SI 330	D6-331	LT6T33	GP-330	UC-5333	5GA-T33	
C78	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C79	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C80	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C81	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C82	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C83	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	Note 2
C84	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C85	20		62-02030901l	NP0-SI 20	TCZ-20	CTA6Q2C	TCO-20	ZT-545	5TCC-Q2	
C86	.5-3		31-6520-12		829-3		3115-D	CT565A		
C87	8		30-1224-46	NP0-SI 8.2			TCO-8.2			
C88	1-5		31-6520-9		829-6					
C89	10		62-01040900l	NP0-SI 10	TCZ-10	CTA6Q1C	TCO-10	ZT-541	5TCC-Q1	
C90	82		62-08240901l	1469-000082	D6-820	CTA6Q82C	ED-82		MS-482	
C91	2000		30-1238-12	DI -002	DD-202	BYA10D2	GP-200	UC-522	5GA-D2	
C92	33		62-03340901l	NP0-SI 33	D6-330	CTA6Q33C	TCO-33	ZT-5433	5TCC-Q3	
C93	.001	1000	30-4650-86	P1088N-001	DD-102	CUB16D1	HD15-1000	GEM-1021	10TM-D1	
C94	.01	1000	30-4650-92	P1088N-01	DD-103	CUB16S1		GEM-1011	10TM-S1	
C95	.1	200	30-4650-47	P288N-1	DF-104	CUB2P1		GEM-201	2TM-P1	
C96	.033	200	30-4650-44	BPD-03	DF-303	CUB6S33		GEM-4133	6TM-S33	Note 3
C97	.01	1000	30-4650-92	P1088N-01	DD-103	CUB16S1		GEM-1011	10TM-S1	Note 4
C98	330		62-13300100l	SI 330	D6-331	LT6T33	GP-330	UC-5333	5GA-T33	
C99	.001	1000	30-4650-86	P1088N-001	DD-102	CUB16D1	HD15-1000	GEM-1021	10TM-D1	
C100	10000		30-1238-2	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1	
C101	.047	600	30-4650-62	BPD-05	DF-503	CUB6S47		GEM-6147	6TM-S47	
C102	1500		62-21500101l	SI 1500	D6-152	LT6D15	GP-1500	UC-5215	5GA-D15	
C103	1500		62-21500101l	SI 1500	D6-152	LT6D15	GP-1500	UC-5215	5GA-D15	
C104	2000		39-1238-12	BPD-002	DD-202	BYA6D2	ED-002	DC522	5HK-D2	
C105	330		62-13300100l	SI 330	D6-331	LT6T33	GP-330	UC-5233	5GA-D33	
C106	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C107	680		62-16800101l	SI 680	D6-681	LT6T68	GP-680	UC-5368	5GA-T68	
C108	12		62-01240900l		TCZ-12	CTA6Q12C	TCO-12			
C109	1-5		31-6520-9		829-6					
C110	1-5		31-6520-9		829-6					
C111	10		62-01040900l	NP0-SI 10	D6-100	CTA6Q1C	TCO-10	ZT-541	5TCC-Q12	
C112	39		62-03940901l	NP0-SI 39	D6-390	CTA6Q39C	TCO-39		5TCC-Q39	
C113	22		62-02200900l	NP0-SI 22	D6-220	CTA6Q22C	TCO-22		5TCC-Q22	
C114	27		62-02740901l	1469-000027	D6-270	CTA6Q27C	TCO-27		MS-427	
C115	15		62-01540901l	NP0-SI 15	D6-150	CTA6Q15C	TCO-15		5TCC-Q15	
C116	10000		30-1238-2	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1	
C117	5000		30-1238-1	BPD-005	DD-502	BYA10D5	ED-005	DC525	5HK-D5	
C118	10000		30-1238-2	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1	
C119	10000		30-1238-2	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1	
C120	3.3		30-1224-103	NP0-SI 3.3	TCZ-3R3	CTA6V33C	TCO-3.3	ZT-5533	5TCC-V33	
C121	27		62-02740901l	1469-000027	D6-270	CTA6Q27C	TCO-27		MS-427	
C122	56		62-05640900l	NP0-SI 56	D6-560	CTA6Q56C	TCO-56		MS-456	
C123	5000		30-1238-1	BPD-005	DD-502	BYA6D5	ED-005	DC525	5HK-D5	
C124	5000		30-1238-1	BPD-005	DD-502	BYA6D5	ED-005	DC525	5HK-D5	
C125	330		62-13300100l	SI 330	D6-331	LT6T33	GP-330	UC-5233	5GA-T33	
C126	1500		62-21500101l	SI 1500	D6-152	LT6D15	GP-1500	UC-5215	5GA-D15	
C127	.022	400	30-4650-54	BPD-02	DF-202	CUB4S22	ED-02	GEM-4122	2TM-S22	
C128	.1	200	30-4650-47	P288N-1	DF-104	CUB2P1		GEM-201	2TM-P1	
C129	10000		30-1238-2	BPD-01	DD-103	BYA6D1	ED-01	DC511	5HK-S1	
C130	10000		30-1238-2	BPD-01	DD-103	BYA6D1	ED-01	DC511	5HK-S1	
C131	.047	200	30-4650-45	BPD-05	DF-503	CUB2S47		GEM-4147	2TM-S47	
C132	.01	600	30-4650-58	BPD-01	D6-103	CUB6S1	GP-10000	GEM-611	6TM-S1	
C133	.01	1000	30-4650-92	P1088N-01	DD-103	CUB16S1		GEM-1011	10TM-S1	
C134	.1	200	30-4650-47	P288N-1	DF-104	CUB2P1		GEM-201	2TM-P1	
C135	.1	400	30-4650-47	P488N-1	DF-104	CUB4P1		GEM-401	4TM-P1	
C136	.0047	400	30-4650-56	BPD-0047	D6-472	CUB6D47	GP-4700	GEM-6247	6TM-D47	
C137	330		62-13300100l	SI 330	D6-331	LT6T33	GP-330	UC-5333	5GA-T33	
C138	1000		30-1238-3	BPD-001	DD-102	BYA6D1	ED-001	DC521	5HK-D1	
C139	33		62-03340901l	SI 33	D6-330	LT6Q33	GP-33	UC-5433	5GA-Q33	
C140	.01	400	30-4650-41	BPD-01	D6-103	CUB4S1	GP-10000	GEM-411	4TM-S1	
C141	.0047	400	30-4650-56	BPD-0047	D6-472	CUB6D47	GP-4700	GEM-6247	6TM-D47	
C142	.01	400	30-4650-41	BPD-01	D6-103	CUB4S1	GP-10000	GEM-411	4TM-S1	
C143	560	500	30-1244-12	1464-00056	D6-561	1R5T56	ED-560		MS-356	
C144	.1	600	30-4650-64	P688N-1	DF-104	CUB6P1		GEM-601	6TM-P1	
C145	.22	600	30-4678-66	P688N-22		CUB6P22		GEM-6022	6TM-P22	
C146	.001	400	30-4650-52	DI -001	D6-102	CUB6D1	GP-1000	GEM-621	6TM-D1	
C147	.001	400	30-4650-52	DI -001	D6-102	CUB6D1	GP-1000	GEM-621	6TM-D1	
C148	.0022	400	30-4650-54	DI -0022	D6-222	CUB6D22	GP-2200	GEM-6222	6TM-D22	
C149	.01	400	30-4650-41	DI-01	D6-103	CUB4S1	GP-10000	GEM-411	4TM-S1	
C150	.022	400	30-4650-43							
C151	.47	200	30-4651-16	P288N-47		CUB2P47		GEM-2047	2TM-P47	
C152	.001	400	30-4650-52	DI-001	D6-102	CUB6D1	GP-1000	GEM-421	4TM-D1	
C153	.1	200	30-4683							Note 5

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

CAPACITORS (cont)

ITEM No	RATING CAP	RATING VOLT	REPLACEMENT DATA PHILCO PART No	AEROVOX PART No	CENTRALAB PART No	CORNELL DUBILIER PART No	ERIE PART No	MALLORY PART No	SPRAGUE PART No	NOTES
C354	330	500	30-10338327	1469-00033		MS333		MS 333		
C355	002	500	30-4650-S3	BPD-02	DM-02A	CUBD2A	GP-1000	GEM-4521	5TM DX	
C356	047	300	30-4650-S6	BPD-06	DM-05A	CUBD6A7		GEM- 4747	2TM 947	
C357	330	500	30-10338-87	1469-00032	DM-03A	BSF733	ED-330		MS-333	Note 6
C358	0047	500	30-4650-S6	BPD-047	DM-047A	CUBD47A7	GP-4700	GEM- 4747	2TM 947	
C359	.1	400	30-4650-47	P2S6M-1	DF-104	CUB47P1		GEM 401	4TM-P1	
C360	.1	250	30-4650-47	P2S6M-1	DF-104	CUB33P1		GEM-201	2TM P1	
C361	.1	200	30-4650-47	P4S6M-1	DF-104	CUB47P1		GEM-401	4TM-P1	
C362	.15	200	30-4650-68	P2S6M-15		CUB33P15		GEM- 2015	2TM-P15	
C363	.01	500	30-4650-P3	P1S6M-01	DD-103	CUB1S01		GEM-1003	10TM 31	
C364	68	5000	30-1348-8	HD-60-68						
C365	56	5000	30-1348-5	HD-60-56						
C366	68	5000	30-1348-6	HD-60-68						
C367	68	5000	30-1348-3	HD-60-68						
C368	104	400								
C369	.1	600	30-4650-S4	P4S6M-1	DF-104	CUB4P1		GEM-601	6TM-P1	Note 6
C370	.01	1000	30-4650-P3	P10S6M-01	DD-103	CUB1S01		GEM-1001	10TM-S1	
C371	1000	15000	30-1229-1							
C372	1000	15000	30-1229-11							
C373	3000	30000	30-1229-13							
C374	500	10000	48-3807-3							
C375	.01	1000	30-4650-P3	P10S6M-01	DD-103	CUB1S01		GEM 1001	10TM-S1	
C376	.01	1000	30-4650-S3	P10S6M-01	DD-103	CUB1S01		GEM 1001	10TM-S1	
C377	.01	1000	30-4650-S3	P10S6M-01	DD-103	CUB1S01		GEM-1001	10TM-S1	
C378	.01	1000	30-4650-P3	P10S6M-01	DD-103	CUB1S01		GEM 1001	10TM-S1	
C379	180	500	30-10185417	HP2-61-180	D6-181	32BS1T6	ED-180		MS-318	Note 7
C380	180	500	30-10185417	HP2-61-180	D6-181	32BS1T6	ED-180		MS-318	
C381	180	500	30-10185417	HP2-61-180	D6-181	32BS1T6	ED-180		MS-318	
C382	.0018	600	30-4651-34	1464-0018		1BS268	ED-1800		MS-218	
C383	.0018	600	30-4651-34	1464-0018		1BS268	ED-1800		MS-218	
C384	.0018	600	30-4651-34	1464-0018		1BS268	ED-1800		MS-218	
C385	.1	200	30-4650-47	P2S6M-1	DF-104	CUB2P1		GEM-201	2TM-P1	Note 9
C386	.001	500	30-4650-S3	BPD-001	DD-102A	CUB1A	GP-1000	GEM-5E	5TM-DE	
C387	39		43-2940-00501	HP2-61-39	D6-390	CTA8Q39	ED-390		GEM-4	
C388	47		43-0470080X	SI 47	D6-470	LT5Q47	GP-47	UC-5447	SGA-Q47	
C389	10000		30-1336-2	BPD-01	DD-103	BYA8S	ED-01	DC51	5HK-S1	
C390A	1000	}		BPD-2X001	DD6-103	BYA1D6S01		DC5S2	5HK-S1	
B	1000									
C391	47	350	30-4651-38	P36M-47		CUB2P47		GEM- 2047	2TM-P47	
C392	5000		30-1335-1	BPD-06	DD-503	BYA1D6S	ED-006	DC525	5HK-D6	
C393	.1	200	30-4650-47	P2S6M-1	DF-104	CUB2P1		GEM-201	2TM-P1	
C394	.1	200	30-4650-47	P2S6M-1	DF-104	CUB2P1		GEM-201	2TM-P1	
C395	.1	200	30-4650-47	P2S6M-1	DF-104	CUB4P1		GEM-401	4TM-P1	
C396	.01	400	30-4650-P3	BPD-01	DD-103	CUB1S01	GP-1000	GEM-1	10TM-S1	
C397	10000		30-1338-3	BPD-01	DD-103	BYA8S	ED-01	DC51	5HK-S1	
C398	10000		30-1338-3	BPD-01	DD-103	BYA8S	ED-01	DC51	5HK-S1	
C399	3	3	30-1334-75	HP0-01-3	TCZ-3R3	TCZ-3		5TCCB-V33		
C400	5000		30-1338-1	BPD-06	DD-503	BYA1D6	ED-006	DC525	5HK-D6	
C401	5000		30-1338-1	BPD-06	DD-503	BYA1D6	ED-006	DC525	5HK-D6	
C402	5000		30-1336-1	BPD-06	DD-503	BYA1D6	ED-006	DC525	5HK-D6	
C403	5000		30-1336-79	BPD-06	DD-503	BYA1D6	ED-006	DC525	5HK-D6	
C404	370	500	50-10375417	HP0-01 370	D6-371	5BS737	ED-370		MS-327	
C405	68		43-1068080X	HP0-01 100	D6-681	LT6T68	GP-680	2T-53	5TCC-T1	
C406	470		43-1470080X	1464-00047	D6-471	LT5T47	GP-470		MS-347	
C407	5000		30-1338-1	BPD-06	DD-503	BYA1D6	ED-006	DC525	5HK-D6	
C408	5000		30-1338-1	BPD-06	DD-503	BYA1D6	ED-006	DC525	5HK-D6	
C409	5000		30-1338-1	BPD-06	DD-503	BYA1D6	ED-006	DC525	5HK-D6	
C410	5000		30-1338-1	BPD-06	DD-503	BYA8S	ED-01	DC51	5HK-S1	
C411	470		43-1470100X	1464-00047	D6-471	5BS747	ED-470		MS-347	
C412	47		43-0470080X	SI 47	D6-470	LT6Q47	GP-47	UC-5427	SGA-Q47	
C413	33		43-0330080X	SI 33	D6-330	LT6Q33	GP-33	UC-5423	SGA-Q22	
C414	10000		30-1338-2	BPD-01	DD-103	BYA8S	ED-01	DC51	5HK-S1	
C415	10000		30-1338-2	BPD-01	DD-103	BYA8S	ED-01	DC51	5HK-S1	
C416	.001	500	30-4650-S7	P2S6M-1	DF-104	CUB2P1		GEM-201	2TM-P1	
C417	10000		30-1338-2	BPD-01	DD-103	BYA8S	ED-01	DC51	5HK-S1	
C418	10000		30-1338-2	BPD-01	DD-103	BYA8S	ED-01	DC51	5HK-S1	
C419	10000		30-1338-2	BPD-01	DD-103	BYA8S	ED-01	DC51	5HK-S1	
C420	3.3	3	30-1334-6	HP0-01 3.3	TCZ-3R3	CTA8V3ZC	TCC-3.3		5TCCB-V33	
C421	3.3		30-1334-6	HP0-01 3.3	TCZ-3R3	CTA8V3ZC	TCC-3.3		5TCCB-V33	
C422	5000		30-1338-1	BPD-06	DD-503	BYA1D6	ED-006	DC525	5HK-D6	
C423	5000		30-1338-1	BPD-06	DD-503	BYA1D6	ED-006	DC525	5HK-D6	
C424	56	500	50-00356337	HP0-0339	TCZ-39	32BS429	TCC-39		MS-439	
C425	56	500	50-00356337	HP0-0339	TCZ-39	32BS429	TCC-56		MS-456	
C426	10000		30-1338-3	BPD-01	DD-103	BYA8S	ED-01	DC51	5HK-S1	
C427	10000		30-1338-3	BPD-01	DD-103	BYA8S	ED-01	DC51	5HK-S1	
C428	10000		30-1338-3	BPD-01	DD-103	BYA8S	ED-01	DC51	5HK-S1	
C429	3.3	500	30-1334-61	HP0-01 3S	TCZ-3T	32BS-QT	TCC-3T		MS-437	
C430	.01	600	30-4650-S8	BPD-01	DD-103	CUB4S	GP-10000	GEM-611	6TM-S1	
C431	.01	600	30-4650-S8	BPD-01	DD-103	CUB4S	GP-10000	GEM-611	6TM-S1	
C432	15		30-00156417	SI 15	D6-150	LT6Q5	GP-15	UC-5415	SGA-Q15	
C433	22		43-0220090X	SI 22	D6-220	LT6Q22	GP-22	UC-5427	SGA-Q22	
C434	680		43-1680080X	SI 680	D6-681	LT6T68	GP-680	UC-5358	SGA-T68	
C435	680		43-1680080X	SI 680	D6-681	LT6T68	GP-680	UC-5358	SGA-T68	
C436	10000	500	30-4650-S8	BPD-01	DD-103	CUB4S	GP-10000	GEM-611	6TM-S1	
C437	10000	500	30-4650-S8	BPD-01	DD-103	CUB4S	GP-10000	GEM-611	6TM-S1	
C438	9000		30-1338-44	BPD-006	DD-503	BYA1D6	ED-006	DC525	5HK-D6	Note 10
C439	3.3	600	30-4678-05	P6S6M-33		CUB6P33		GEM-6033	6TM-P33	Note 11
C440	3.3	3		HP0-01 3.3	TCZ-3R3	C1V33ZC	TCC-3.3	27-5533	5TCCB-V33	Note 11
C441	.01	1000	30-4650-93	P10S6M-01	DD-103	CUB1S01		GEM-1001	10TM-01	Note 11

Note 2. Deleted in chassis TV-123, Run 4
Note 3. Chassis TV-123, Run 4 uses 01MFD in this application (part #20-4650-41).
Note 4. Chassis TV-123, Run 3 uses 270MMF in this application (part #60-10275417).
Note 5. Special unit. Must be ordered from Mfgr.
Note 6 "Sikkiol in chassis TV-123, Run 3
Note 7. Chassis TV-123, Run 4 uses 220MMF in this application (part #60-10235417).
Note 8. Chassis TV-123, Run 4 uses .0022MFD, 5%, 400V unit in this application (part #30-4651-23).
Note 9. Chassis TV-123, Run 3 uses .15MFD in this application (part #20-4650-41).
Note 10. Added in chassis TV-123, Run 3.
Note 11. Added in chassis TV-123, Run 4.
Note 12. Added in chassis TV-123, Run 4.

PARTS LIST AND DESCRIPTIONS (Continued)

CONTROLS

ITEM No	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA PHILCO PART No	CENTRALAB PART No	CLAROSTAT PART No	IRC PART No	MALLORY PART No	INSTALLATION NOTES
R1A	5Meg		33-5673-11				U2320E	Tone
B	250K						Not Req.	Volume - Tap @150K
C	Switch						Not Req.	
R2A	2000Ω		33-5673-18				U2319	Color - Note 1
B	7000Ω						Not Req.	Color
R3A	250K		33-5561-91	B-50	A47-350K-6	GU-130	U26	Vert. Hold
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	
R4A	30K		33-5668-94	B-33	A47-30K-6	GU-118	U36	Horiz. Hold
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	
R5A	2000Ω		33-5561-93	B-6	A47-2000-6	GU-110	U6	Brightness
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	
R6A	2000Ω		33-5561-103	B-6	A47-2000-6	GU-110	U6	Contrast
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	
R7A	1500Ω		33-5673-7					Green Vert. Tilt
B	2000Ω							Green Vert. Amp.
R8A	1000Ω		33-5673-8					Blue Vert. Tilt
B	5000Ω							Blue Vert. Amp.
R9A	1000Ω		33-5673-7					Red Vert Tilt
B	2000Ω							Red Vert. Amp
R10A	1000Ω		33-5673-9					Red Horiz. Amp.
B	10000Ω							Green Horiz. Amp.
R11A	1.5Meg		33-5673-58				BU-138	Hi-Voltage Regulator
B	Shaft						TM1-KIT	
R12A	5Meg		33-5673-53	AB-14	A47-10K-6	GU-116	U2320	Red G3
B	Meg			AK-1	FKS-1/4	RQ	Not Req.	Blue Horiz. Amp.
R13A	750K		33-5673-15				U2416	Blue G3
B	750K						Not Req.	Green G3
R14A	5Meg		33-5673-10				U2320	Blue G3
B	Meg						Not Req.	Green G3
R15A	5000Ω	*	33-5583					Purity
B	5000Ω	*						Purity
R16A	250K		33-5673-17					Horiz. Freq.
B	50Ω							Burst Timing
R17A	10K		33-5673-32	AB-14	A47-10K-6	GU-116	U41	Horiz. Drive
B	Shaft			AK-1	FKS-1/4	RQ	Not Req.	
R18A	1000Ω		33-5546-88					Vert. Centering -tap @450
B	1000Ω	2						Horiz. Centering
R19A	1500Ω		33-5673-58	VK-14	A43-3000	WPH1500	RJ6001	Vert. Linearity
B	Shaft			Not Req.	FKS-1/4	Not Req.	Not Req.	
R20A	2.5Meg		33-5673-1	AB-53	A47-2.5Meg-6	GU-139	U2391	Height
B	Shaft							
R21	5Meg		33-5673-1	AK-1	FKS-1/4	RQ	Not Req.	Focus
R22	5Meg							AGC
R23A	500K		33-5673-38	AB-54	A47-500K-6	GU-133	U2451	
B	Shaft			AK-1	FKS-1/4	RQ	Not Req.	

* Element open at extreme end.
Note 1. Open at the left hand terminal

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA PHILCO PART No	IRC PART No	NOTES
R23A	180Ω				
B	180Ω	2	53-1365		
C	97Ω				
D	10Ω				
E	180Ω				
R24	470K		66-4158340	BTS-470K	
R25	680Ω		66-4158240	BTS-680	
R26	330K		66-4478240	BTS-330K	
R27	20K	4	66-4478140	1 3/4A-10-20K	
R28	100K		66-4158340	BTS-100K	Note 2
R29	470K 5%		66-4478240	BTS-470K 5%	
R30	470K 5%		66-4478240	BTS-470K 5%	Note 15
R31	100Ω		66-1028340	BTS-100	
R32	680Ω		66-1828340	BTS-680	
R33	15K		66-3158340	BTS-15K	
R34	100K		66-4158340	BTS-100K	
R35	330Ω		66-2828340	BTS-330	
R36	33000Ω	3	66-2823440	BTS-3300	
R37	68K	1	66-3568440	BTS-68K	
R38	22K		66-3228340	BTS-22K	
R39	220Ω		66-1228340	BTS-220	
R40	680Ω		66-1668340	BTS-680	
R41	2200Ω		66-2228340	BTS-2200	
R42	180Ω		66-1828340		
R43	220Ω		66-1228340	BTS-220	
R44	2700Ω		66-2728340	BTA-2700	
R45	47Ω		66-0478240	BTS-47	
R46	220Ω		66-2228340	BTS-220	
R47	270Ω		66-2278340	BTA-2700	
R48	47Ω		66-0478240	BTS-47	
R49	1000Ω		66-3028340	BTS-1000	
R50	2700Ω	1	66-2728340	BTA-2700	
R51	1000Ω		66-3028340	BTS-1000	
R52	10000Ω		66-3828340	BTS-10000	
R53	82000Ω		66-3828440	BTS-82000	
R54	10000Ω		66-3028340	BTS-1000	
R55	1500Ω		66-1528340	BTS-1500	
R56	22000Ω		66-2828440	BTS-22000	
R57	15K		66-3158340		Note 1
R58	15K		66-3158340		Note 1
R59	220Ω		66-1228340	BTS-220	
R60	220Ω	2	66-1228340	BTS-220	
R61	330Ω		66-3328340	BTS-330	
R62	5600Ω	1	66-2568340	BTS-5600	
R63	220Ω		66-1228340	BTS-220	
R64	5600Ω		66-2568340		Note 1
R65	2200Ω		66-2228340		Note 1
R66	27000Ω		66-2728340		
R67	56000Ω	1	66-2568340	BTA-5600	
R68	18000 5%		66-3188240	BTS-1800 5%	
R69	1000Ω	1	66-3028340	BTA-1000	
R70	220Ω		66-1228340	BTS-220	
R71	15K	2	66-3158340	BTB-15K	
R72	5000Ω	5	33-1335-116	PWT-5000	
R73	680 5%		66-0688240	BTS-68 5%	
R74	100K		66-4158340		
R75	180K	1	66-4188340		
R76	18000 5%		66-3188240	BTS-1800 5%	

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA PHILCO PART No	IRC PART No	NOTES
R77	15K		66-3158340		
R78	82000		66-2828440	BTS-8200	
R79	33000	1	66-2334340	BTA-3300	
R80	100Ω		66-4068340		
R81	68Ω		66-1828340		
R82	470Ω		66-1478340		
R83	100K		66-4158340		
R84	3300Ω		66-4068340	BTS-100K	Note 2
R85	100K		66-4158340	BTS-56	
R86	56K		66-3568440	BTS-2700	Note 15
R87	2700Ω	5	33-1335-119	PW10-8200	
R88	8200Ω		66-3288340	BTS-3700	Note 15
R89	3700Ω	2	66-2565340	BTS-5600	
R90	5600Ω		66-2568340	BTS-27K	
R91	27K		66-3278340	BTS-1.5Meg	
R92	1.5Meg		66-5158340	BTS-270K	
R93	270K		66-4278340	BTS-330K	
R94	330K		66-4338340	BTA-3300	
R95	3300Ω	1	66-2334340	BTA-6200	
R96	22K		66-3228340	BTS-22K	
R97	120K		66-4128340	BTS-120K	
R98	150K		66-4158340	BTS-150K	
R99	470K 5%		66-4478240	BTS-470K 5%	
R100	47K		66-3478340	BTS-47K	
R101	1Meg 5%		66-5108240	BTS-1Meg 5%	
R102	6.8Meg 5%		66-5688240	BTS-6.8Meg 5%	
R103	68K 5%		66-3688240	BTS-68K 5%	
R104	22K		66-3228340	BTS-22K	
R105	330Ω		66-1338340	BTS-330	
R106	330Ω		66-1338340	BTS-330	
R107	330Ω		66-1338340	BTS-330	
R108	82000Ω		66-2828340	BTS-8200	
R109	47000		66-2478340	BTS-4700	
R110	3300Ω		66-2338340	BTS-3900	
R111	10000		66-3028340	BTS-2200	
R112	2200		66-1228340	BTS-220	
R113	100K		66-4028340	BTS-100K	
R114	4700Ω		66-2478340	BTS-4700	
R115	220Ω		66-1228340	BTS-220	
R116	56K		66-3568340	BTS-56K	
R117	33K		66-3338340	BTS-33K	
R118	15K		66-3158340	BTS-15K	
R119	330Ω		66-1338340	BTS-330	
R120	22K		66-3228340	BTS-22K	
R121	39Ω		66-1398340	BTS-390	
R122	22K		66-3228340	BTS-22K	
R123	15K		66-3158340	BTS-15K	
R124	10Meg		66-6108340	BTS-10Meg	
R125	10K		66-3108340	BTS-10K	
R126	330K		66-4338340	BTS-330K	
R127	680K		66-4688340	BTS-680K	
R128	3.9Meg		66-5398340	BTS-3.9Meg	
R129	180Ω	1	66-1818340	BTA-180	
R130	10000	7	33-1335-89	PWT-1000	
R131	330K		66-4338340	BTS-330K	
R132	12Meg		66-6128340	BTS-12Meg	
R133	39000		66-3928340	BTS-3900	
R134	10K	1	66-3108340	BTA-10K	

RESISTORS (cont)

ITEM No	RATING OHMS	RATING WATT	REPLACEMENT DATA PHILCO PART No	IRC PART No	NOTES
R135	15K	1	66-3158340	BTA-15K	
R136	82000		66-2828340	BTS-8200	
R137	470K		66-4478340	BTS-470K	
R138	33000 5%		66-3338240	BTS-3300 5%	
R139	27000 5%		66-3278240	BTS-2700 5%	
R140	37K	3%	66-3278340	BTS-37K	
R141	33000 5%		66-3338240	BTS-3300 5%	
R142	33K		66-3338340	BTS-33K	
R143	82000 5%		66-3828240	BTS-8200 5%	
R144	33K		66-3338340	BTS-33K	
R145	33K		66-3338340	BTS-33K	
R146	560K		66-4568340	BTS-560K	
R147	1.2Meg		66-5128340	BTS-1.2Meg	
R148	Note 4		33-1345-1	DCC-1000 1%	
R149	2.2Meg		66-5228340	BTS-2.2Meg	
R150	68K	1	66-3688440	BTA-68K	
R151	390Ω		66-1398340	BTA-390	Note 5
R152	470Ω	1	66-1478340	BTA-470	Note 5
R153	1000Ω		66-3108340		
R154	1000Ω		66-3108340		
R155	50Ω	7	33-1335-84	PWT-50	
R156	330Ω		66-1338340	BTS-330	
R157	4700Ω		66-2478340	BTS-4700	
R158	68Ω	2	66-1828340	BTS-68K	
R159	4700Ω		66-2478340	BTS-4700	
R160	68K	3	66-3688340	BTS-68K	
R161	10000Ω		66-3108340	BTS-10000	
R162	68K	2	66-3688340	BTS-68K	
R163	10000Ω		66-3108340	BTS-10000	
R164	1500 5%		66-3158240	BTS-1500 5%	
R165	150K 5%		66-4158240	BTS-150K 5%	
R166	150K 5%		66-4158240	BTS-150K 5%	
R167	4.7Meg		66-5478340		
R168	470K 5%		66-4478240	BTS-470K 5%	
R169	470K 5%		66-4478240		
R170	68K		66-3688340		
R171	15K		66-3158340		
R172	47K	3	66-3478340		
R173	68K		66-3688340	BTB-47K	
R174	100Ω 5%		66-3108240	BTS-100 5%	
R175	68Ω		66-3688340		
R176	270K 5%		66-4278240	BTS-270K 5%	
R177	2700Ω 5%		66-3278240		
R178	100K		66-4068340	BTA-100K	
R179	680Ω		66-3688340		
R180	1500 5%		66-3158240		
R181	470K		66-4478340		
R182	10K	3	66-4478340		
R183	5000Ω	5	33-1335-118	PWT-5000	
R184	390Ω		66-1398340		
R185	470K		66-4478340		
R186	4.7Ω		66-0478340	BW1-4.7	
R187	470K	1	66-4478340	BTA-470K	
R188	470K	1	66-4478340	BTA-470K	
R189	1.2Meg		66-5128340	BTS-1.2Meg	
R190	330K		66-4338340	BTS-330K	
R191	7.5Meg		33-1352-1		
R192	10K	3	66-3108340	BTB-10K	
R193	22K			BTB-22K	Note 7
R194	22K			BTB-22K	Note 7
R195	22K			BTB-22K	Note 7
R196	39000	1	66-3928340	BTA-3900	
R197	22K		66-3228340	BTS-22K	
R198	100K		66-4068340	BTS-100K	
R199	390K		66-4398340	BTS-390K	
R200	6800Ω	3	66-2685340	BTB-6800	
R201	150Ω		66-1518340	BTS-150	
R202	12000		66-3128340	BTS-1200	
R203	27K		33-1364	BTS-27K	Note 8
R204	270K		33-1364	BTS-270K	Note 8
R205	.. 5Meg		66-5158240	BTS-.. 5Meg	
R206	22Meg 5%		66-5228240	BTS-22Meg 5%	
R207	680K 5%		66-4688240	BTS-680K 5%	
R208	39K		66-3398340	BTB-39K	
R209	180K		66-4188340	BTS-180K	
R210	27K		66-3278340	BTS-27K	
R211	33K		66-3338340	BTS-33K	
R212	82000 5%		66-3828240	BTS-8200 5%	
R213	330K		66-4338340	BTS-330K	
R214	15K		66-3158340	BTS-15K	
R215	2.7Meg 5%		66-5278240	BTS-2.7Meg 5%	
R216	1.2Meg 5%		66-5128240	BTS-1.2Meg 5%	
R217	330K		66-4338340	BTA-330K	
R218	1000Ω 1%		33-1345-2	DCC-1000 1%	
R219	100Ω		66-1038340	BTS-100	
R220	3900Ω	1	66-2398340	BTA-3900	
R221	33K		66-3338340	BTS-33K	
R222	180Ω		66-1818340	BTS-180	
R223	150Ω		66-1518340	BTS-150	
R224	270K		66-4278340	BTS-270K	
R225	1500		66-3158340	BTS-160	
R226	120000		66-3128340	BTS-1200	
R227	12K	3%	66-3128340	BTS-12K 5%	
R228	33000	1	66-3338340	BTA-3300	
R229	470Ω		66-1478340	BTA-470	
R230	39000	2	66-3398340	BTA-3900	
R231	56K		66-3568340	BTS-56K	
R232	18000Ω		66-3188340	BTS-1800	
R233	820Ω		66-1828340	BTS-150	
R234	390K		66-4398340	BTS-3900	
R235	3900Ω	7	33-1335-93	PWT-1500	
R236	1500Ω	5	33-1335-127	PWT-1500	
R237	12K	3%	66-3128340	BTB-12K 5%	
R238	12K	3%	66-3128340	BTB-12K 5%	
R239	3300Ω		66-2338340	BTS-3300	
R240	330Ω	1	66-1338340	BTA-330	
R241	220Ω	3	66-1228340	BTB-220	
R242	3300Ω		66-2338340	BTB-3300	
R243	3300Ω		66-2338340	BTB-3300	
R244	68K 5%	2	66-3688240	BTB-68K 5%	Note 10
R245	47K 5%	2	66-3478240	BTB-47K 5%	
R246	47K 5%	2	66-3478240	BTB-47K 5%	
R247	33K	2	66-3338340	BTB-33K	
R248	82K 5%	3	66-3828240	BTB-82K 5%	
R249	82K 5%	3	66-3828240	BTB-82K 5%	
R250	15K		66-3158340	BTS-15K	
R251	470K		66-4478340	BTS-470K	
R252	470K		66-4478340	BTS-470K	
R253	5000Ω	5	33-1335-118	PWT-5000	
R254	470K		66-4478340	BTS-470K	
R255	470K		66-4478340	BTS-470K	
R256	180Ω	1	66-1818340	BTS-180	
R257	10000	7	33-1335-89	PWT-1000	
R258	33K		66-3338340	BTB-33K	Note 11
R259	33K		66-3338340	BTB-33K	Note 11
R260	10K		66-3108340	BTB-10K	
R261	10K		66-3108340	BTB-10K	
R262	33K	2	66-3338340	BTB-33K	Note 11
R263	33K	3	66-3338340	BTB-33K	
R264	30-35	15	66-3338340	30-35	
R265	56K		66-3568340	BTS-56K	
R266	100K		66-4028340	BTS-100K	
R267	470K		66-4478340	BTB-470K	
R268	33	3	66-0335340	BTB-33	Note 12
R269	56K		66-3568340	BTS-56K	Note 13
R270	22K		66-3228340	BTS-22K	Note 13
R271	100K		66-4158340	BTS-100K	Note 13
R272	100K		66-4108340	BTB-100K	Note 13
R273	18000		66-3188340	BTS-1800	Note 14
R274	10000		66-3108340	BTS-1000	Note 14

Note 1: Deleted in chassis TV-123, Run 4.
Note 2: Deleted in chassis TV123, Run 3.
Note 3: A 390K resistor used in chassis TV123, Run 2. (Part #66-4398340)
Note 4: This resistor is a temperature compensation type approximately 800K cold.
Note 5: A 390Ω 2W resistor used in chassis TV123, Run 2. (Part #66-1398340)
Note 6: A 470Ω 2W resistor used in chassis TV123, Run 2. (Part #66-1478340)
Note 7: Part of HV anode cable Philco part #41-4216-2.
Note 8: Matched pair.
Note 9: A 330K 5% 1W resistor used in chassis TV123, Run 2. (Part #66-4234240)
Note 10: Replaced by a 22K 5% 2 W (Part #66-3228240) & a 18K 5% 2W (Part #66-3185240) wired in parallel-chassis TV 123, Run 2.
Note 11: Changed TV 123, Run 4 uses a 47K 2W resistor.(Part #66-3478340)
Note 12: Used in chassis TV123, Run 3.
Note 13: Added in chassis TV 123, Run 3.
Note 14. Added in chassis TV 123, Run 4.
Note 15. A 1500Ω resistor used in some versions (Part #66-2158340).

TRAN

PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA							
		PHILCO PART No.	Halldorson PART No.	Merit PART No.	RCA TYPE No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T2	Vert. Osc. Trans.	32-8431-14 ①	B6705 ②	A-3004②		V404 ②	VBO-200	26A02 ②	A-120Z ②
T3	Horiz. Output Trans.	32-8716-1							
T4	Vert. Output Trans.	32-8599-2 ③	Z1900②④					26S75②④	
T5A	Yoke-Horiz(12. 3MH)	76-9649-1							
B	Vert(103MH)								
T6	Horiz. Limiting Coil	32-4661-2							
T7A	Width-Series Coil (. 13-1. 36MH)	32-4658-2							
B	Parallel Coil (90-305MH)								
T8	Neutralizing Coil Assy.	76-10055 ⑤							
T9	Vert. Centering Choke	32-8717-1							
T10	Horiz. Convergence Coil	32-4661-6							
T11	Green Horiz. Phase Coil	32-4661-4							
T12	Blue Horiz. Phase Coil	32-4661							
T13	Red Horiz. Phase Coil	32-4661							
T14	Convergence Yoke Assy.	76-9650-1 ⑥							

① Some versions may use alternate Philco part no. 32-8431.
② Drill new mounting hole(s).
③ Some versions may use alternate Philco part no. 32-8599.
④ Use 7 to 1 turns ratio.
⑤ Does not include neutralizing coil assembly plug. (Philco part no. 27-6302-14)
⑥ Does not include convergence yoke assembly plug. (Philco part no. 27-6225-6)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	PHILCO PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T15	5200Ω	3-4Ω	32-8685	Z1002	A-3019	A-3849	26S49	S-5Z	

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	PHILCO PART No.	QUAM PART No.	
SP1	8"	PM	6-8Ω	36-1651-16 ① 36-1651-8 ②	8A21Z6	① Used in models 22D5102L, 22D5102M. ② Used in model 22D5100 only.
SP2	8"	PM	6-8Ω	36-1651-16 ①	8A21Z6	

COILS (RF-IF)

ITEM No.	USE	PHILCO PART No.	NOTES
L1	IF Trap	32-4552-3	
L2	VHF Ant. Coils	328-0061	
L3	VHF Aux. Ant.	328-0060	
L4	RF Choke	32-4642-1	
L5	Neut. Coil	32-4623-50	
L6	VHF RF Coils	328-0052	
L7	VHF Mixer Grid Coils	328-0062	
L8	VHF Osc. Coils	328-0051	
L9	RF Choke	32-4623-67	
L10	Conv. Plate	32-4548-6	

ITEM No.	USE	REPLACEMENT DATA				NOTES
		PHILCO PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L11	RF Choke	32-4597-16				. 23 Microhenry
L12	41. 25MC Trap	32-4548-37				3 Microhenries
L13	47. 25MC Trap	32-4548-37				3 Microhenries - Note 1
L14	1st Video IF Grid Coil	32-4548-3				1. 1 Microhenries
L15	Fil. Choke	32-4112-49				3 Microhenries
L16	1st Video IF Plate Coil	32-4112-31	19-3001	TV-189	6175	. 85 Microhenry
L17	39. 5MC Trap	32-4548-37				3 Microhenries
L18	41. 25MC Trap	32-4548-37				3 Microhenries
L19	2nd Video IF Grid Coil	32-4548-3				1. 1 Microhenries
L20	Fil. Choke	32-4112-49				3 Microhenries
L21	2nd Video IF Plate Coil	32-4548-38				2. 2 Microhenries
L22	47. 25MC Trap	32-4548-39				2. 2 Microhenries
L23	3rd Video IF Grid Coil	32-4797-21				1. 24 Microhenries
L24	Fil. Choke	32-4112-49				3 Microhenries
L25	4th Video IF	32-4486-49				
L26	Fil. Choke	32-4112-49				3 Microhenries
L27	RF Choke Channel 8 Beat	32-4112-56				7. 2 Microhenries
L28	Series Peaking Coil	32-4112-31	19-3001■	TV-189■	6175■	. 85 Microhenry; Wound on 15K Resistor - Note 2
L29	41. 25MC Trap	32-4662-1				
L30	47. 25MC Trap	32-4548-3				1. 1 Microhenries
L31	Series Peaking Coil	32-4597-20			4606	2. 7 Microhenries
L32	Series Peaking Coil	32-4674	19-1005		4612	10 Microhenries
L33	RF Choke Channel 8 Beat	32-4112-56				7. 2 Microhenries
L34	3. 58MC Trap	32-4467-25	17-6017			
L35	Shunt Peaking Coil	32-4480-5	19-4400		6136	400 Microhenries
L36	Series Peaking Coil	32-4480-3	19-3100	TV-181	6112	100 Microhenries
L37	Series Peaking Coil	32-4480-11			6110	60 Microhenries
L38	Series Peaking Coil	32-4480-15	19-3250		6154	220 Microhenries
L39	Shunt Peaking Coil	32-4467-23	19-1922			160-512 Microhenries
L40	Series Peaking Coil	32-4480-18	19-3160		6120	150 Microhenries
L41	Shunt Peaking Coil	32-4480-4	19-3250	TV-185	6181	250 Microhenries
L42	Chroma & Sound IF Trans.	32-4598-12				
L43	Chroma & Sound IF Det.	32-4662-3				
L44	Chroma Det.	32-4112-31	19-3001	TV-189	6175	. 85 Microhenry
L45	Series Peaking Coil	32-4674	19-1005		4612	10 Microhenries
L46	RF Choke Channel 8 Beat	32-4112-56				7. 2 Microhenries
L47	1st Chroma IF Grid Coil	32-4660-6A				
L48	1st Chroma IF Grid Coil	32-4660-6A				
L49	4. 5MC Trap	32-4463-15	20-1004	TV-151	1469	
L50	2nd Chroma IF Plate Coil	32-4662				
L51	Sound IF	32-4662-2				Tapped ② 2Ω
L52	Ratio Det.	32-4631-1A	17-3497	TV-115	6205	
L53	RF Choke	32-4112-50	19-1006		4624	15 Microhenries
L54	RF Choke	32-4112-50	19-1006		4624	15 Microhenries
L55	RF Choke	32-4112-50	19-1006		4624	15 Microhenries
L56	Series Peaking Coil	32-4480-5	19-4400		6136	400 Microhenries

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (cont)

ITEM No.	USE	REPLACEMENT DATA				NOTES
		PHILCO PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L57	Phase Det.	32-4657A				
L58	Series Peaking Coil	32-4143-24				25 Microhenries
L59	Chroma Reference Osc. Coil	32-4660-7A				Tapped ⓐ 1. 2Ω
L60	Chroma Plate Coil	32-4660-5A				
L61	Demodulator Trans.	32-4660-4A				Tertiary winding = 1. 2Ω
L62	Quadrature Coil	32-4659-1				Includes trimmer cap. 1. 5-7MMF.
L63	Demodulator Delay	32-4660-3A				Includes Caps. Tapped.
L64	RF Choke	32-4666-1	19-5101			3. 4MC Resonance, 1960 Microhenries.
L65	RF Choke	32-4666-1	19-5101			3. 4MC Resonance, 1960 Microhenries.
L66	RF Choke	32-4666-1	19-5101			3. 4MC Resonance, 1960 Microhenries.
L67	Cathode Choke	32-4480-1				40 Microhenries - Note 3
L68	Series Peaking Coil	32-4422-27				10 Microhenries - Note 4
L69	Series Peaking Coil	32-4422-27				10 Microhenries - Note 4

■ Parallel with 10K resistor.
Note 1: Alternate part #32-4548-39 is a 2. 2 Microhenries used in chassis stamped Run 4.
Note 2: Alternate part #66-3108340 is used in chassis stamped Run 4.
Note 3: Used in chassis stamped Run 2.
Note 4: Used in chassis stamped Run Z.

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES.		REPLACEMENT DATA							NOTES
	PRI.	SEC.	PHILCO PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	RCA TYPE No.	Ram PART No.	Thordarson PART No.	
L70	10. 3Ω		32-4557-5							

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA					
	TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE (0 CURRENT 1000 ∿)	PHILCO PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L71	.190A	66Ω	2. 65 HY	32-8438-1 32-8438 *	C5030	C-2974①	C-2325	26C43 ①	C-21X ①
L72	. 350A	47Ω	2. 3 HY	32-8478-4 32-8478-2*			C-2334		

① Drill one new mounting hole.
* Alternate Philco part number.

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			PHILCO PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	2" piece #26 wire							
M2	2" piece #26 wire							
M3	3AG	3/4A 250V	AD-2245-6	76-9875	312. 750 (3AG-3/4A	357003	AGC 3/4	4411
			45-2656-22*		313. 750 (3AG-S/B-7/10)	357003	MDL 7/10	4411
M4	3AG	1A 250V	AD-2245-7	76-9875	31200l. (3AG-1A)	357003	AGC 1	4411
			45-2656-32*		31300l. (3AG-S/B-1A)	357003	MDL 1	4411
M5	3AG S/B	1/2A 250V	AD-2246-10	76-9875	313. 500 (3AG-S/B-1/2A)	357003	MDL 1/2	4411
			45-2656-31*		313. 400 (3AG-S/B-4/10A)	357003	MDL 4/10	4411

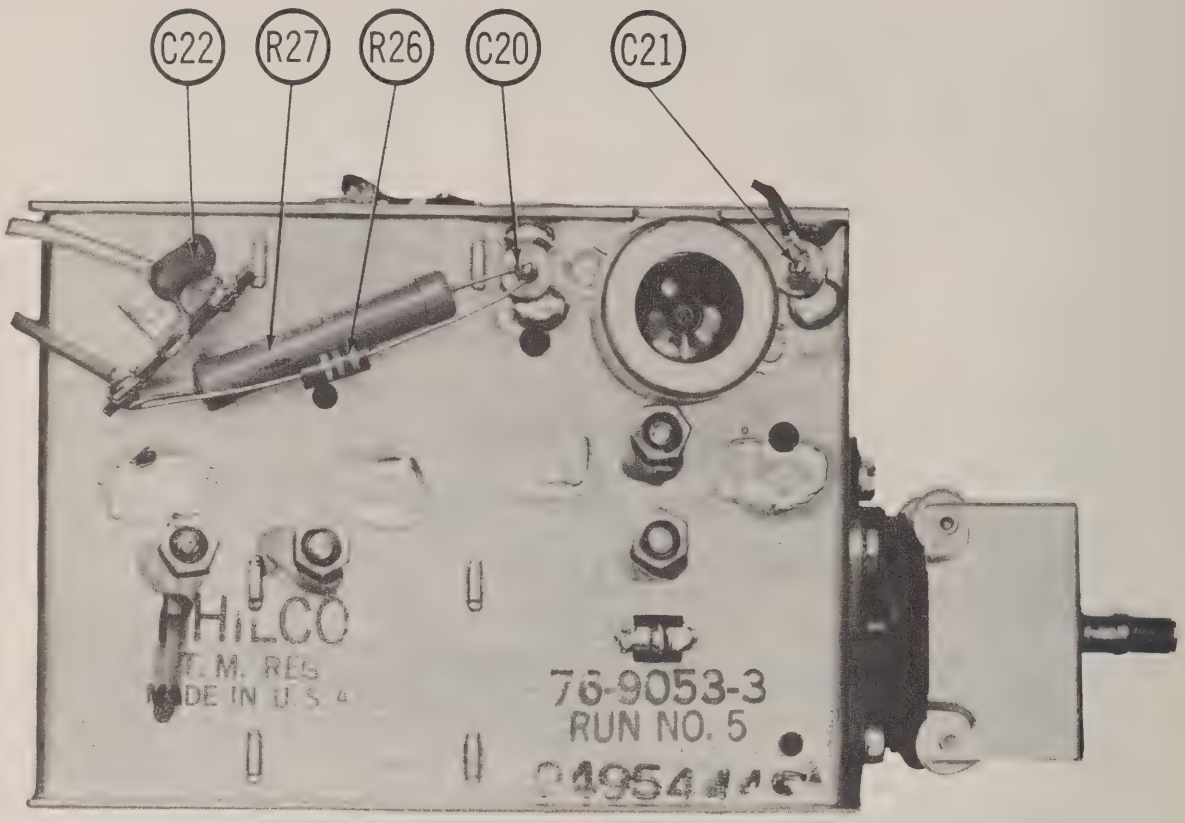
* Alternate part number used in Run #4.

CRYSTAL DIODES

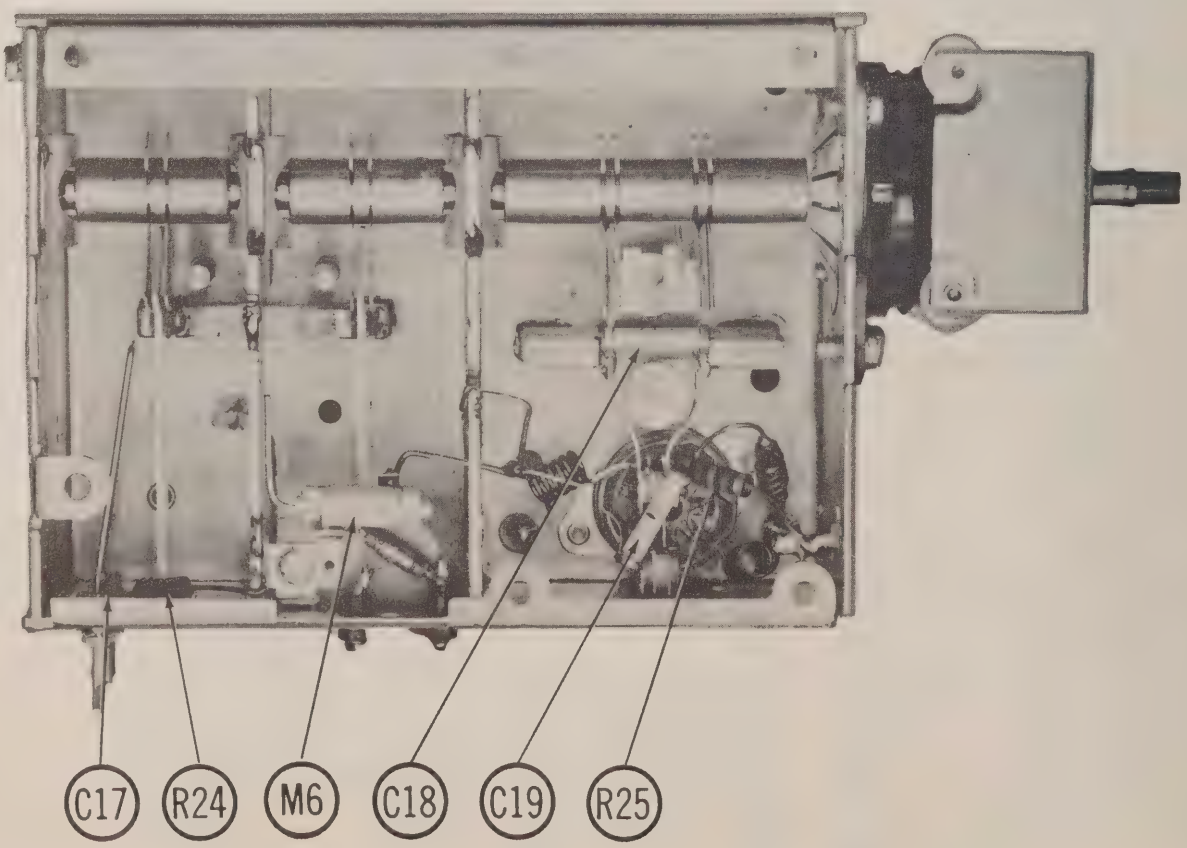
ITEM No.	ORIG. TYPE	REPLACEMENT DATA		NOTES
		PHILCO PART No.	SYLVANIA PART No.	
M6	1N173		1N82A	UHF Mixer (Clip In)

MISCELLANEOUS

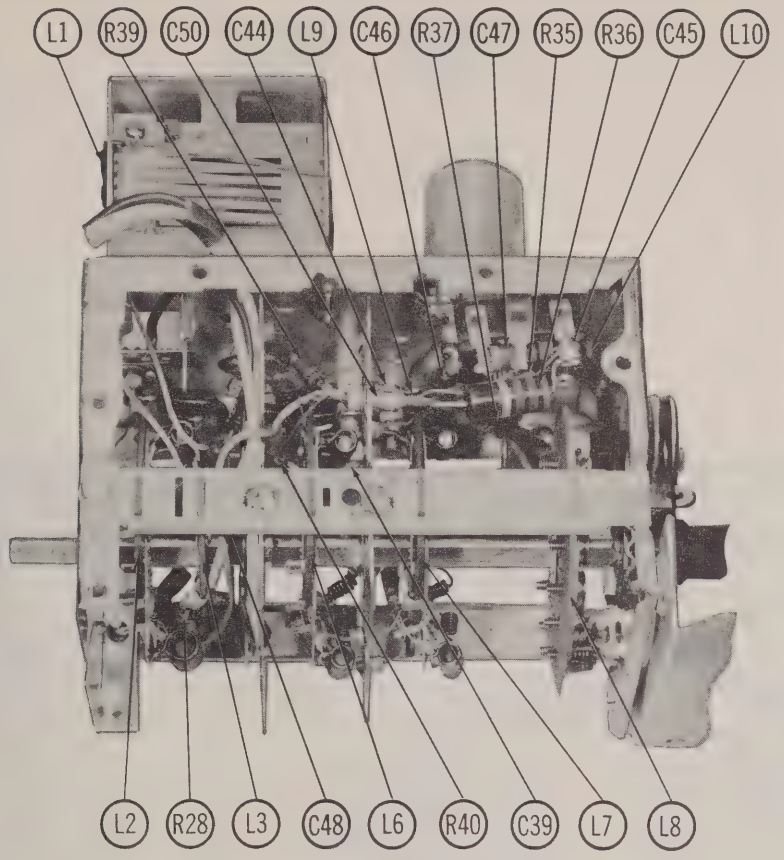
ITEM No.	PART NAME	PHILCO PART No.	NOTES
M7	Dial Light	3463-4	#1847, UHF.
M8	Dial Light	3463-4	#1847, VHF.
M9	Tuner	UT26A	UHF.
M10	Tuner	76-9480-3	VHF.
M11	Ant. Crossover Network	76-9042-1	Includes coils, resistors and caps.
M12	Delay Line	32-4656-2	Luminance Channel.
M13	Crystal	34-8028	3. 579545MC Oscillator.
M14	Switch	42-2060	Attenuator, VHF Antenna, Slide Type (2 Position)
M15	Switch	42-2056	Antenna Changeover (Slide Type)
M16	Magnet	76-9652-2	Blue Lateral Beam Positioning
M17	Magnet Ass'y.	76-10016	Purity Ring Ass'y. , Retaining Clip Part #228-0062 (8 Used)
M18	Magnet Ass'y.	76-9651	Color Purity
M19	High Voltage Cable	41-4216-2	Includes R193, R194 & R195.
M20	Variable Cap.	31-5630-1	Hue, 4-25MMF.
	Insulator Ring	54-9666	
	Insulating Cone	54-9653	
	Safety Glass	54-9212-41	Model 22D5102.
	Safety Glass	54-9212-40	Model 22D5100.
	Mask	54-6241	Model 22D5102.
	Mask	54-6241-1	Model 22D5100.



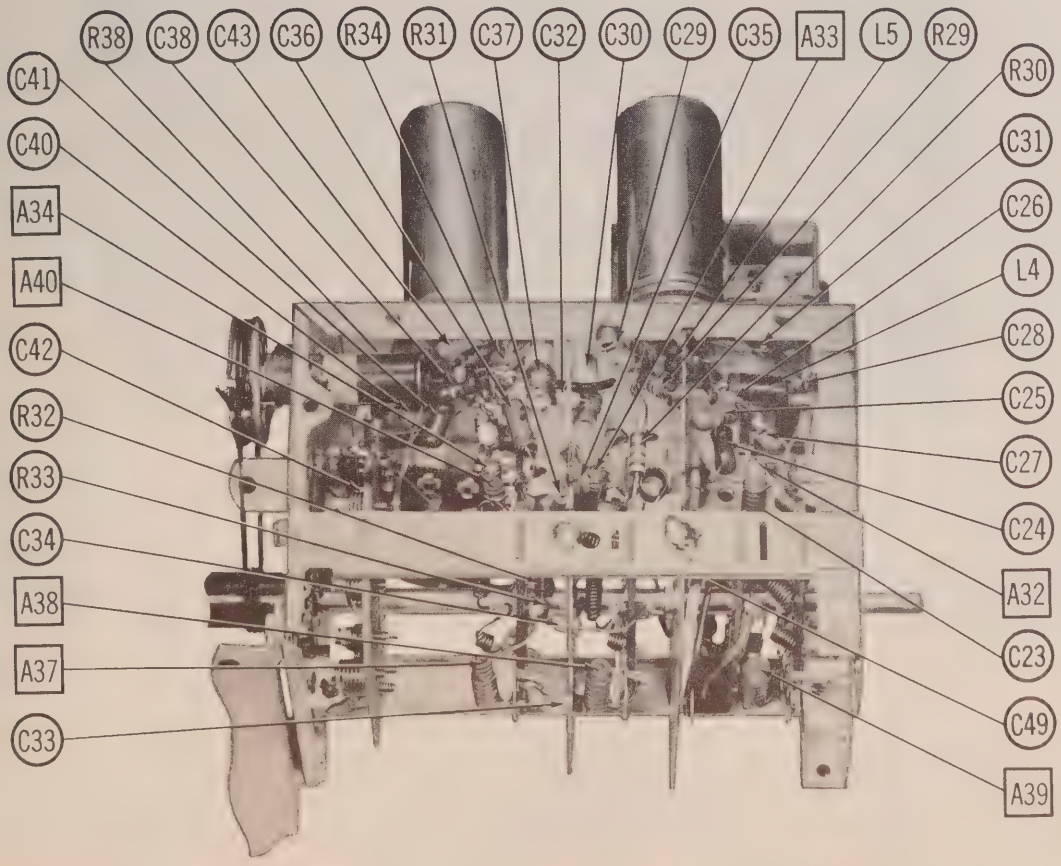
UHF TUNER TOP VIEW



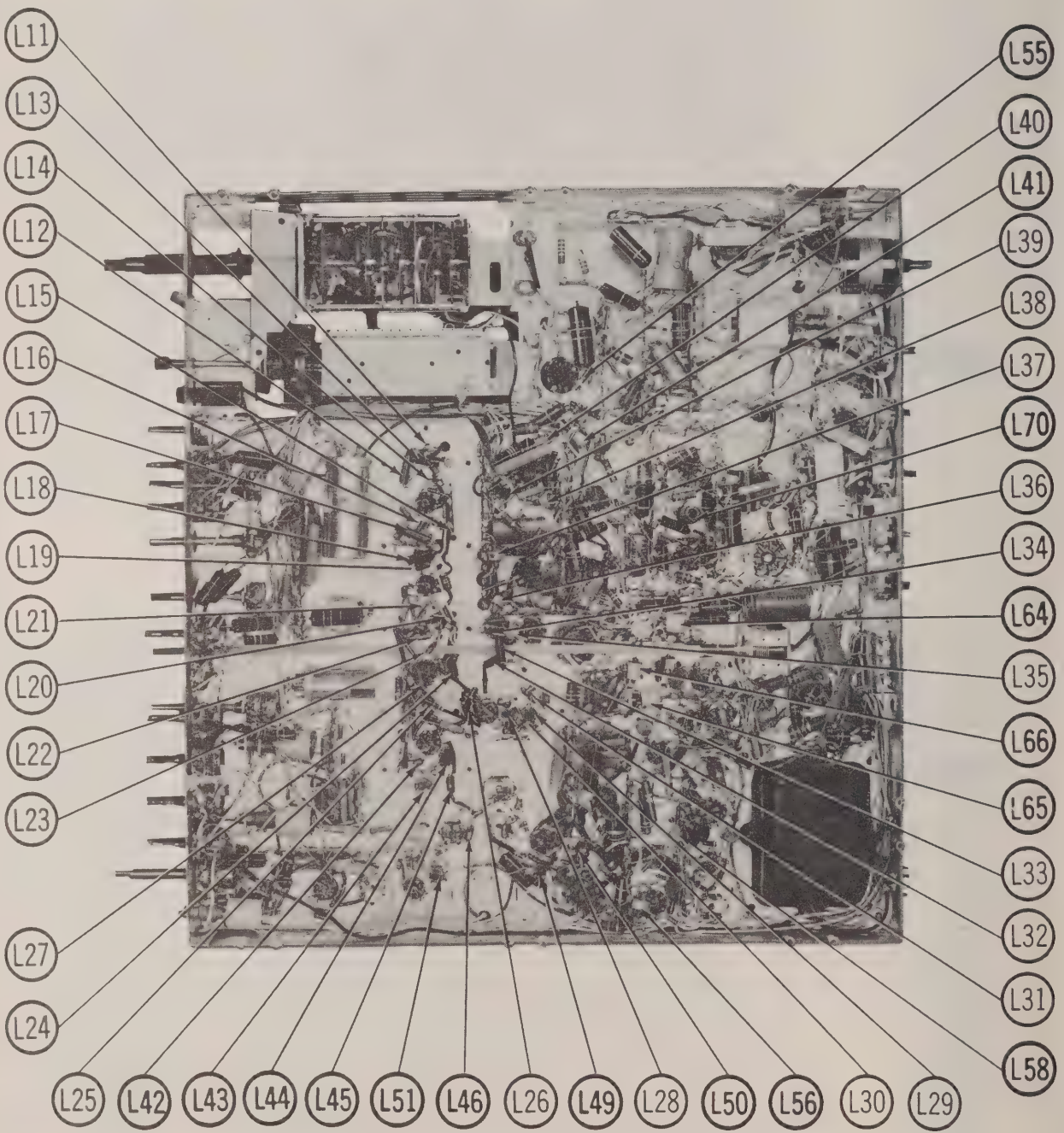
UHF TUNER-BOTTOM VIEW



VHF TUNER-LEFT SIDE



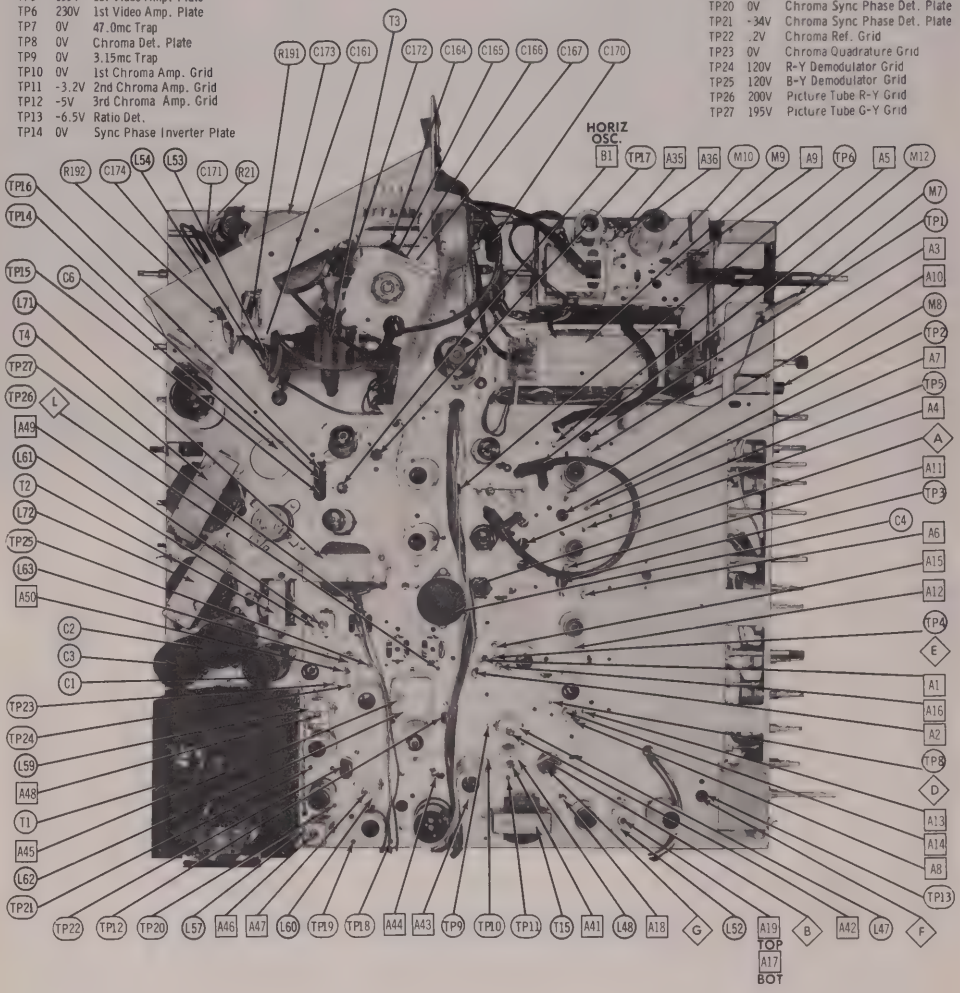
VHF TUNER-RIGHT SIDE



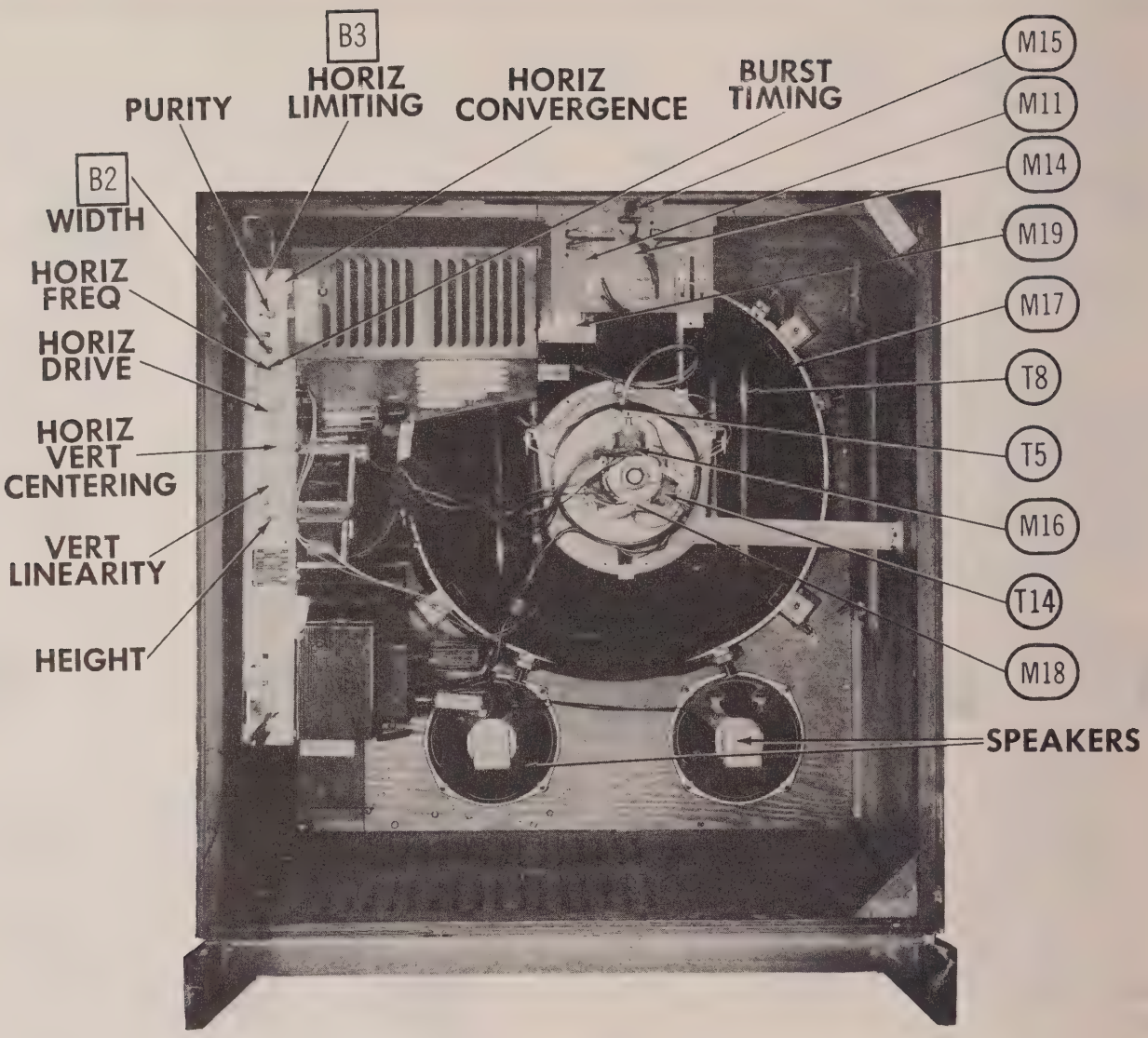
CHASSIS BOTTOM VIEW INDUCTOR IDENT.

TP1	0V	1st Video IF Grid
TP2	-3.1V	2nd Video IF Grid
TP3	0V	3rd Video IF Grid
TP4	0V	41.25mc Trap
TP5	155V	1st Video Amp. Plate
TP6	230V	1st Video Amp. Plate
TP7	0V	47.0mc Trap
TP8	0V	Chroma Det. Plate
TP9	0V	3.15mc Trap
TP10	0V	1st Chroma Amp. Grid
TP11	-3.2V	2nd Chroma Amp. Grid
TP12	-5V	3rd Chroma Amp. Grid
TP13	-6.5V	Ratio Det.
TP14	0V	Sync Phase Inverter Plate

TP15	0V	Horiz. AFC
TP16	125V	Horiz. Mult Plate
TP17	90V	Horiz. Mult Grid
TP18	-13V	Burst Keying Grid
TP19	80V	Burst Amp. Grid
TP20	0V	Chroma Sync Phase Det. Plate
TP21	-34V	Chroma Sync Phase Det. Plate
TP22	.2V	Chroma Ref. Grid
TP23	0V	Chroma Quadrature Grid
TP24	120V	R-Y Demodulator Grid
TP25	120V	B-Y Demodulator Grid
TP26	200V	Picture Tube R-Y Grid
TP27	195V	Picture Tube G-Y Grid



CHASSIS TOP VIEW



CABINET—REAR VIEW

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 14 wood screws. Remove rear cover.
2. Remove 10 push-on type control knobs.
3. Remove 1 wing nut from inside front of cabinet.
4. Remove 5 wood screws and control panel.
5. Remove 2 speaker plugs, 2 antenna leads, picture tube socket, yoke plug, convergence yoke plug, neutralizing coil plug, and HV anode plug.
6. Remove 1 metal screw holding bracket on HV cage.
7. Remove 6 chassis board volts.
8. Remove chassis.
9. Remove 8 speaker nuts and 2 speakers.

SIDE PANEL REMOVAL

1. Remove rear cover as in "Chassis Removal".
2. Remove 2 wing nuts from inside cabinet.
3. Remove 2 wood screws and side panel.

PICTURE TUBE REMOVAL

1. Remove chassis.
2. Remove blue lateral corrector magnet, purity magnet, and convergence yoke assembly.
3. Lay cabinet and tube front down.
4. Remove 5 hex nuts, 1 wood screw and remove picture tube and yoke assembly.
5. Remove 1 metal screw holding edge purity strap and yoke assembly. Remove these from tube.
6. Remove insulating cone.

SAFETY GLASS AND PICTURE TUBE CLEANING

1. Remove 2 wood screws holding metal nameplate.
2. Remove nameplate and using extreme care when removing safety glass.

RCA VICTOR
MODEL 7-BX-9H (Ch. RC1163)

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

TRADE NAME	RCA Victor Model 7-BX-9H (Ch. RC-1163)
MANUFACTURER	RCA Victor Radio & "Victrola" Div., Radio Corp. of America, Camden 8, N. J.
TYPE SET	Three Power Portable BC-SW Receiver
TUBES (Five)	Types 1T4 RF Amplifier, 1L6 Converter, 1T4 IF Amplifier, 1U5 Det-AVC-AF Amp., 3V4 Output
POWER SUPPLY	110-120 Volts AC-DC (or) 9 Volts "A" Supply & 90 Volts "B" Supply In Pack Form
RATING	.12 Amp. @ 117 Volts AC (or) 50MA @ 9 Volts DC & 17MA @ 90 Volts DC
TUNING RANGE—BROADCAST	540KC - 1600KC SHORT WAVE 2MC - 5MC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use battery power, if possible. If AC power is used, use an isolation transformer when available. If not, connect a .1MFD capacitor in series with low side of the signal generator and B-. Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
	Disconnect loop and remove bottom chassis cover.							
1.	.005MFD	High side to pin 6 (grid) of 1T4 (V3). Low side to chassis.	455KC (400% Mod)	BC (Band "A")	Point of non-interference near 1600KC.	Across voice coil.	A1, A2	Adjust for maximum output. If AC power is used without an isolation transformer, reduce dummy antenna to 200MMF to reduce hum modulation.
2.	"	High side to RF stator lug (middle section of tuning gang). Low side to chassis.	"	"	"	"	A3, A4	"
	Before proceeding with step 3, replace bottom chassis cover and connect loop. Place loop in same position as in assembled receiver.							
3.		Loop	1620KC	"	Tuning gang fully open.	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
4.		"	1400KC	"	Tune to 1400KC signal.	"	A6, A7	"
5.		"	600KC	"	Tune to 600KC signal.	"	A8, A9	Adjust for maximum output while rocking tuning gang. Repeat steps 3, 4 and 5.
6.		"	5200KC	SW (Band "B")	Tuning gang fully open.	"	A10	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
7.		"	4800KC	"	Tune to 4800KC signal.	"	A11, A12	"
8.		"	2000KC	"	Tune to 2000KC signal.	"	A13, A14	Adjust for maximum output while rocking tuning gang. Repeat steps 6, 7 and 8.
	With receiver installed in cabinet check adjustment A12 (SW Ant. Trimmer) at 4800KC and A7 (BC Ant. Trimmer) at 1400KC.							

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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PARTS LIST AND DESCRIPTIONS

RCA VICTOR
MODEL 7-BX-9H (Ch. RC-1163)

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	RF Amplifier	1T4	
V2	Converter	1L6	
V3	IF Amplifier	1T4	
V4	Det.-AVC-AF Amp.	1U5	
V5	Output	3V4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA RCA Victor PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲50	150	76659	AFH4-32	DO270	WP405.5	TMQ-31	Q-080	TVL-4410.7
B	■40	150							
C	▲160	25							
D	40	25							

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA RCA Victor PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C2	.0047	200	101721	BPD-0047	D6-472	CUB6D47	GP-4700	GEM-6247	6TM-D47	
C3	82		71514		TCN-82	TN16	TC7-82			
C4	.047	400	77422	BPD-05	DF-503	CUB4S47		GEM-4147	4TM-S47	
C5	.047	400	77422	BPD-05	DF-503	CUB4S47		GEM-4147	4TM-S47	
C6	5		75613	NP0-S15	TCZ-4R7	Z011	TCO-5	ZT-555	5TCCB-V47	
C7	.047	400	77422	BPD-05	DF-503	CUB4S47		GEM-4147	4TM-S47	
C8	82		71514		TCN-82	TN20	TC7-82			
C9	56		71924	N750-S156	TCN-56	TN16	TC7-56			
C10	360	500	72572	1469-00036		5R5T36			MS-336	
C11	.047	400	77422	BPD-05	DF-503	CUB4S47		GEM-4147	4TM-S47	
C12	1800	500	39658	1464-0018		1R5D18			MS-218	
C13	10000		73960	BPD-01	DD-103	K082	ED-01	DC511	5HK-S1	
C14	.0033	400	102425	BPD-0033	D6-332	CUB6D33	GP-3300	GEM-6233	6TM-D33	
C15	4		102430			Z009				
C16	82		71514		TCN-82	TN20	TC7-82			
C17	.01	200	101000	BPD-01	D6-103	CUB4S1	GP-10000	GEM-411	4TM-S1	
C18	180		71922	S1 180	D6-181	TP36	GP-180	UC-5318	5GA-T18	
C19	.022	200	102080	BPD-02	DD-203	CUB4S22	ED-02	GEM-4122	2TM-S22	
C20	.01	400	101000	BPD-01	D6-103	CUB4S1	GP-10000	GEM-411	4TM-S1	
C21	.0022	400	102079	BPD-0022	D6-222	CUB6D22	GP-2200	GEM-6222	6TM-D22	
C22	.0039	400	102218	SI4000	D6-402	CUB6D4	GP-4000	GEM-624	6TM-D4	
C23	.047	200	78921A	BPD-05	DF-503	CUB2S47		GEM-4147	2TM-S47	
C24	.047	200	78921A	BPD-05	DF-503	CUB2S47		GEM-4147	2TM-S47	
C25	.047	200	78921A	BPD-05	DF-503	CUB2S47		GEM-4147	2TM-S47	
C26	.047	400	75071	BPD-05	DF-503	CUB2S47		GEM-4147	4TM-S47	
C27	.1	400	77423	P488N-1	DF-104	CUB4P1		GEM-401	4TM-P1	

CONTROLS

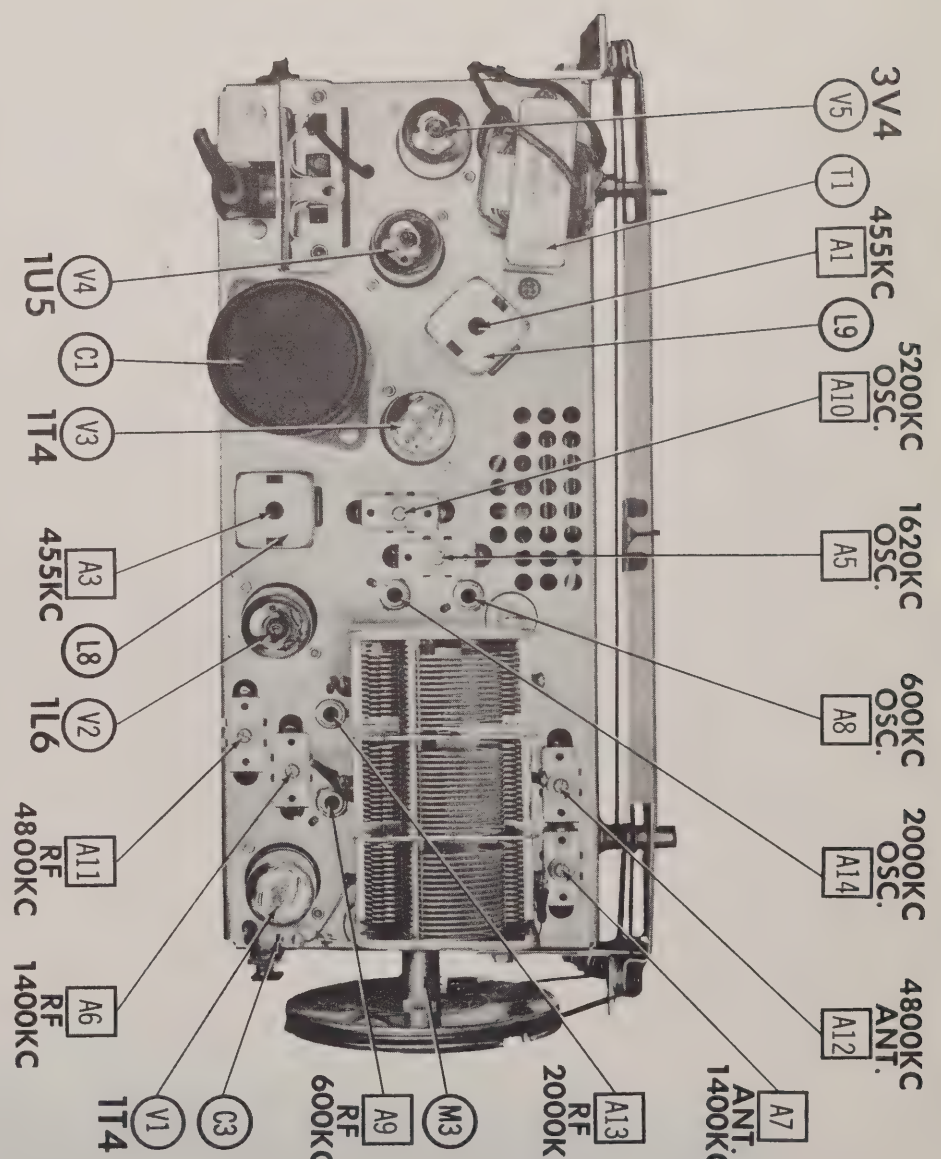
ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA RCA Victor PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1Meg	½	101999	AB-70	A47-1Meg-Z	Q13-137	U53	Volume
B	Shaft			AK-3	FS-3	Not Req.	Not Req.	
C	Switch			KB-2	SWE-20	76-2	US-27	

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA RCA Victor PART No.	REPLACEMENT DATA IRC PART No.	NOTES
R2	3.9Meg		502539	BTS-3.9Meg	
R3	3.9Meg		502539	BTS-3.9Meg	
R4	1000Ω		502210	BTS-1000	
R5	39K		502339	BTS-39K	
R6	1Meg		502510	BTS-1Meg	
R7	180K		502418	BTS-180K	
R8	56K		502356	BTS-56K	
R9	5.6Meg		31455	BTS-5.6Meg	
R10	3.3Meg		502533	BTS-3.3Meg	
R11	27K		502327	BTS-27K	
R12	68K		502368	BTS-68K	
R13	10Meg		502610	BTS-10Meg	
R14	220K		502422	BTS-220K	

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS (cont)

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA RCA Victor PART No.	REPLACEMENT DATA IRC PART No.	NOTES
R15	4.7Meg		30931	BTS-4.7Meg	
R16	1Meg		502510	BTS-1Meg	
R17	1800Ω		502218	BTS-1800	
R18	2700Ω		502227	BTS-2700	
R19	1500Ω		502215	BTS-1500	
R20	1800Ω		502218	BTS-1800	
R21	15K		502315	BTS-15K	
R22	2300Ω	7	102357		
R23	1800Ω	1	512218	BTA-1800	
R24	100Ω	4	102429	PW4-100	

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA RCA Victor PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	9500Ω	3-4Ω	102364	Z1117	A-2932	A-3879	24S52	S-17X	

SPEAKER

ITEM No.	TYPE SIZE	TYPE FIELD	TYPE V. C. IMP.	REPLACEMENT DATA RCA Victor PART No.	REPLACEMENT DATA QUAM PART No.	NOTES
SP1	4"	PM	3-4Ω	77055	4A07	

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA RCA Victor PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	SW. Ant. Shunt Coil	102432			6152	18.6 Microhenries
L2	SW RF Coil	102369				
L3	SW Osc. Coil	102367				
L4	Loop Stick	102340				
L5	BC Ant. Loading Coil	102431	19-3160		6120	151 Microhenries
L6	BC RF Coil	102368	14-1076			
L7	BC Osc. Coil	102366	14-1077			
L8	Input IF	73129	16-6758	BC-352	12-C1	
L9	Output IF	73130	16-6770	BC-355	12-C6	

SELENIUM RECTIFIER

ITEM No.	RATING CURRENT	REPLACEMENT DATA RCA Victor PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	NOTES
M1	.048A	77958	1003A	RS075	6S75	5M4	75	

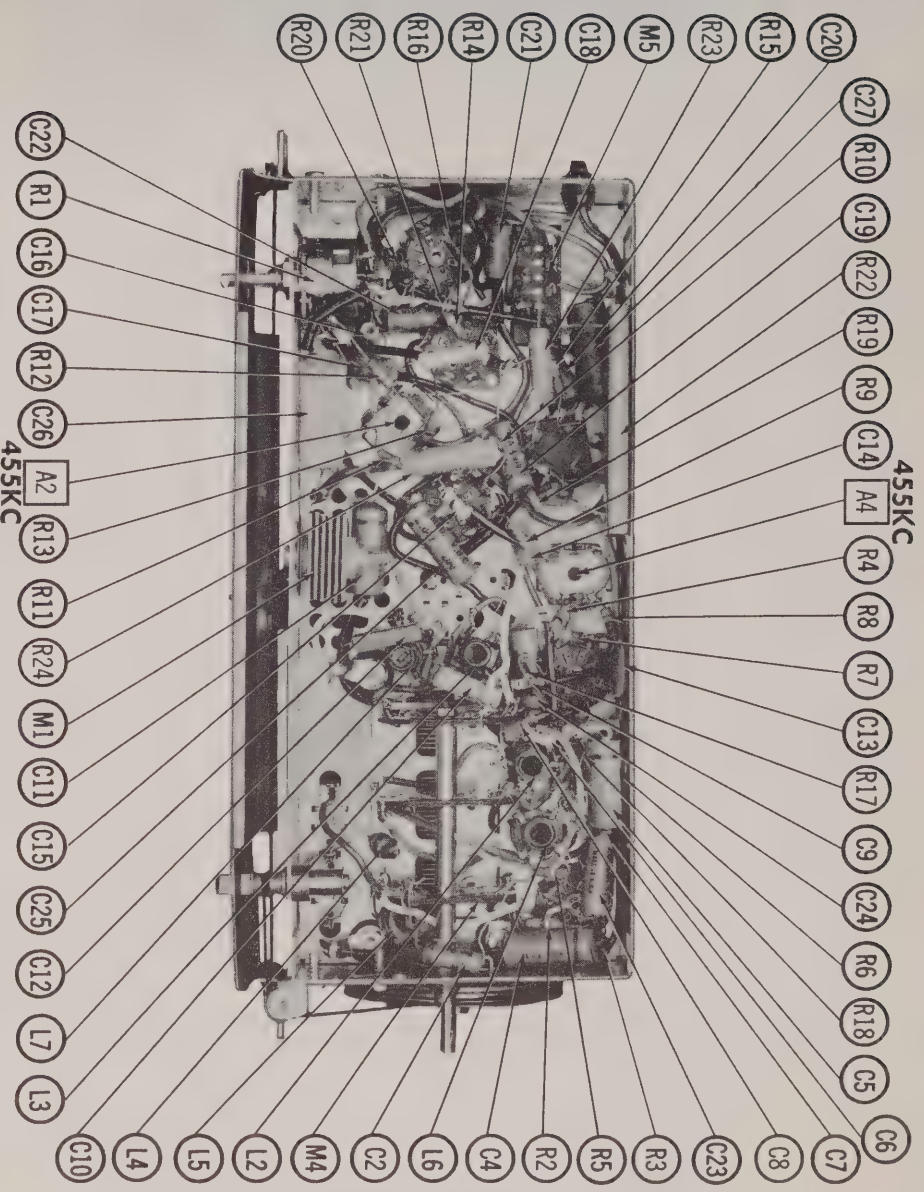
BATTERIES

ITEM No.	VOLTAGE	RCA Victor PART No.	REPLACEMENT DATA EVEREADY "A"	EVEREADY "B"	EVEREADY "A-B"	BURGESS "A"	BURGESS "B"	BURGESS "A-B"	INSTALLATION NOTES
M2	9V "A" 90V "B"	VS057W			756			T6Z60	

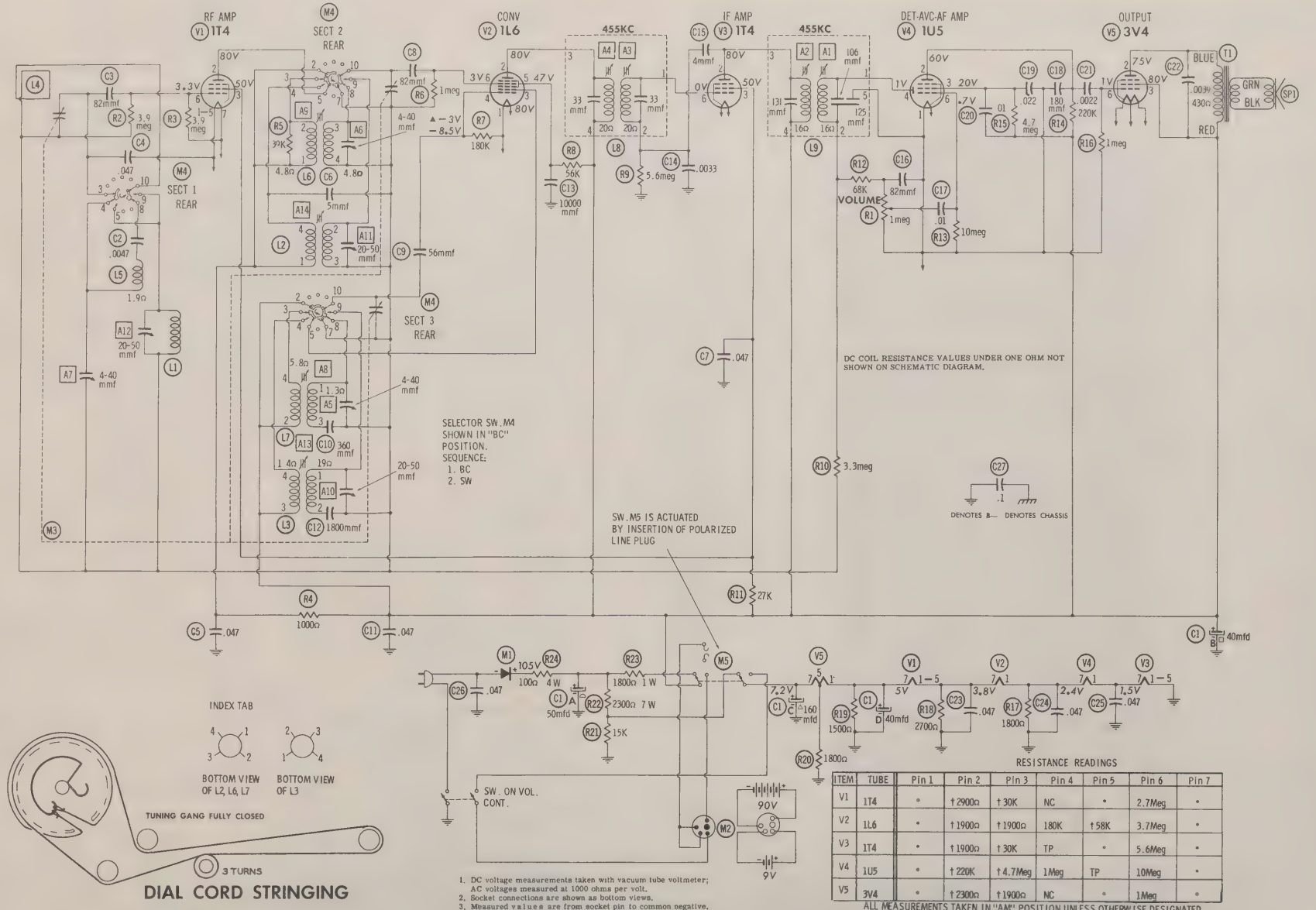
MISCELLANEOUS

ITEM No.	PART NAME	RCA Victor PART No.	NOTES
M3	Tuning Cap.	102360	3 Gang (13-485MMF, 13-485MMF, 10-400MMF)
M4	Switch	102363	Function (3 Gang Rotary - Wafer Type)
M5	Switch	38905	Battery-Line (DPDT - Slide Type)
	Pointer	101926	
	Case Front	Y2934	With Grille, Window & Emblem
	Case Back	Y2935	
	Handle	102328	
	Knob	102338	Function
	Knob	102336	Tuning
	Knob	102334	On-Off-Volume
	Window	101918	Dial

CHASSIS—BOTTOM VIEW



RCA VICTOR
MODEL 7-BX-9H (Ch. RC-1163)



1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
5. Volume control at maximum, no signal applied for voltage measurements.

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	1T4	•	†2900Ω	†30K	NC	•	2.7Meg	•
V2	1L6	•	†1900Ω	†1900Ω	180K	†58K	3.7Meg	•
V3	1T4	•	†1900Ω	†30K	TP	•	5.6Meg	•
V4	1U5	•	†220K	†4.7Meg	1Meg	TP	10Meg	•
V5	3V4	•	†2300Ω	†1900Ω	NC	•	1Meg	•

ALL MEASUREMENTS TAKEN IN "AM" POSITION UNLESS OTHERWISE DESIGNATED.
▲ MEASURED IN "SW" POSITION.
• DO NOT USE OHMMETER TO MEASURE FILAMENT RESISTANCE.
† MEASURED FROM OUTPUT OF M1.
NC NO CONNECTION
TP TIE POINT

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349-10

H. H. SCOTT
MODEL 223

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

H. H. SCOTT
MODEL 223

H. H. SCOTT
MODEL 223

TRADE NAME	H. H. Scott Model 223
MANUFACTURER	Hermon Hosmer Scott, Inc., 385 Putnam Ave., Cambridge 39, Mass.
TYPE SET	AC Operated Audio Amplifier
TUBES (Four)	Types 12AX7 AF Amp.-Phase Inv., (2) 6L6GB Output, 5U4GA Rectifier
POWER SUPPLY	110-120 Volts AC-60 Cycles. RATING .97 Amp. @ 117 Volts AC

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	AF Amp. -Phase Inv.	12AX7	
V2	Output	6L6GB	
V3	Output	6L6GB	
V4	Rectifier	5U4GA	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA H. H. Scott PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲20	475		AFH4-19-20	BO500	FP475	TMQ-123	Q-075	TVL-4834
B	■20	475			BO500			MT-4720	
C	▲20	475							
D	20	475							
C2	50	100		PRS150V50	BR5015	TC49	TD-50-150	FM-1550	TVA-1414

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA H. H. Scott PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C3	.0068	400		BPD-0068	D6-682	CUB6D68		GEM-6268	6TM-D68	
C4	.0027	400		BPD-0025	D6-272					
C5	100			BPD-0001	DD-101	G042	ED-100	UC-531	5GA-T1	
C6	20000			BPD-02	DD-203	K085	ED-02		5HK-S2	
C7	.047	400		BPD-05	DF-503	CUB4S47		GEM-4147	4TM-S47	
C8	330			BPD-00033	DD-331	G056	ED-330	UC-5333	5GA-T33	
C9	.047	400		BPD-05	DD-503	CUB4S47		GEM-4147	4TM-S47	

CONTROLS

ITEM No.	RATING RESIST-ANCE	RATING WATTS	REPLACEMENT DATA H. H. Scott PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	500K	½		B-60	A47-500K-Z	Q13-133	U48	Level
B	Shaft			Not Req.	RS-2	Not Req.	Not Req.	
R2A	50K	½		AB-31	A47-50K-S	Q11-123	SU-35	Balance
B	Shaft			AK-1	FKS-1/4	RQ	Not Req.	

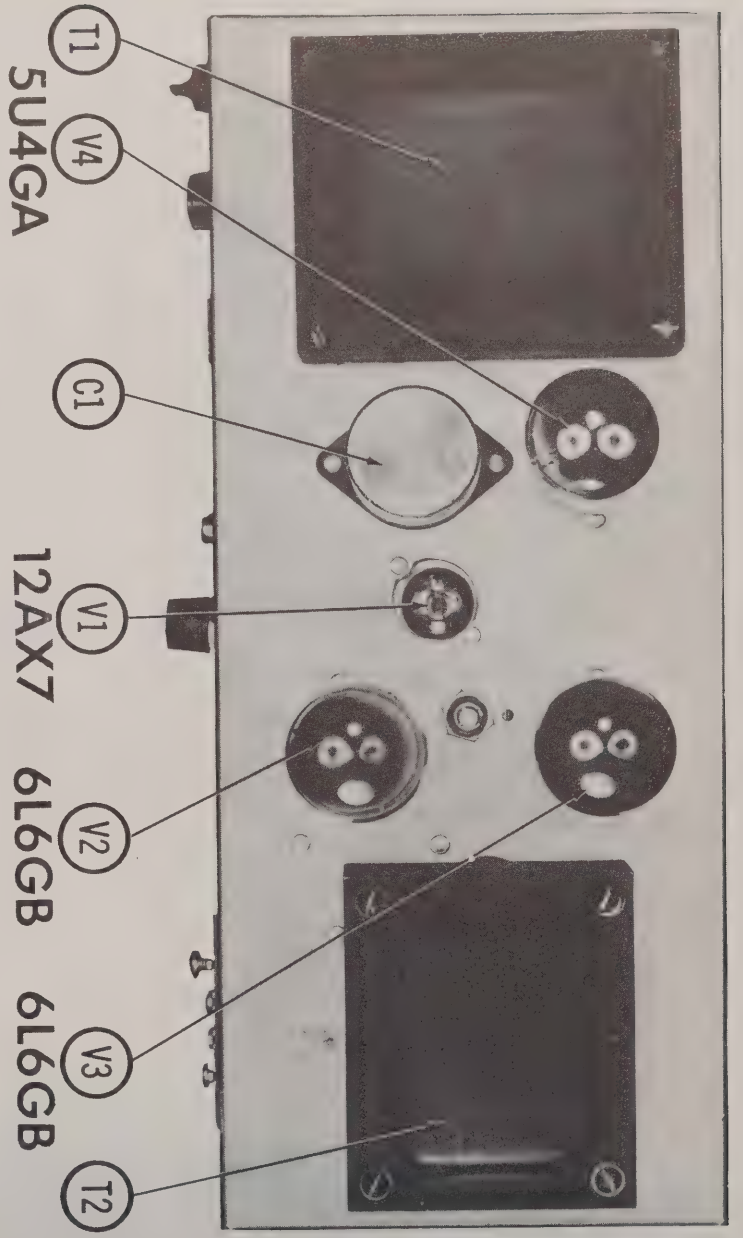
RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA H. H. Scott PART No.	REPLACEMENT DATA IRC PART No.	NOTES
R3	2. 2Meg			BTS-2. 2Meg	
R4	100K	1		BTA-100K	
R5	220K			BTS-220K	
R6	1800Ω			BTS-1800	
R7	12K			BTS-12K	
R8	2. 2Meg			BTS-2. 2Meg	
R9	100K	1		BTA-100K	
R10	270K			BTS-270K	
R11	1500Ω			BTS-1500	
R12	12K			BTS-12K	
R13	330K			BTS-330K	

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA H. H. Scott PART No.	REPLACEMENT DATA IRC PART No.	NOTES
R14	6800Ω			BTS-6800	
R15	1000Ω			BTS-1000	
R16	330K			BTS-330K	
R17	1000Ω			BTS-1000	
R18	160Ω	5		PW7-150	
R19	25K	10		1 3/4A-25K	
R20	3300Ω	2		BTB-3300	
R21A	33Ω	4			
B	160Ω	5			
C	1500Ω	2			

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	H. H. Scott PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC @ .97A	700VCT @ .130A	5VAC @ 3A	6.3VCT @ 2.1A	TR-10-3	P9315	P-2953①	PM8411 ①	22R07	R-168 ①

① Fabricate mounting.

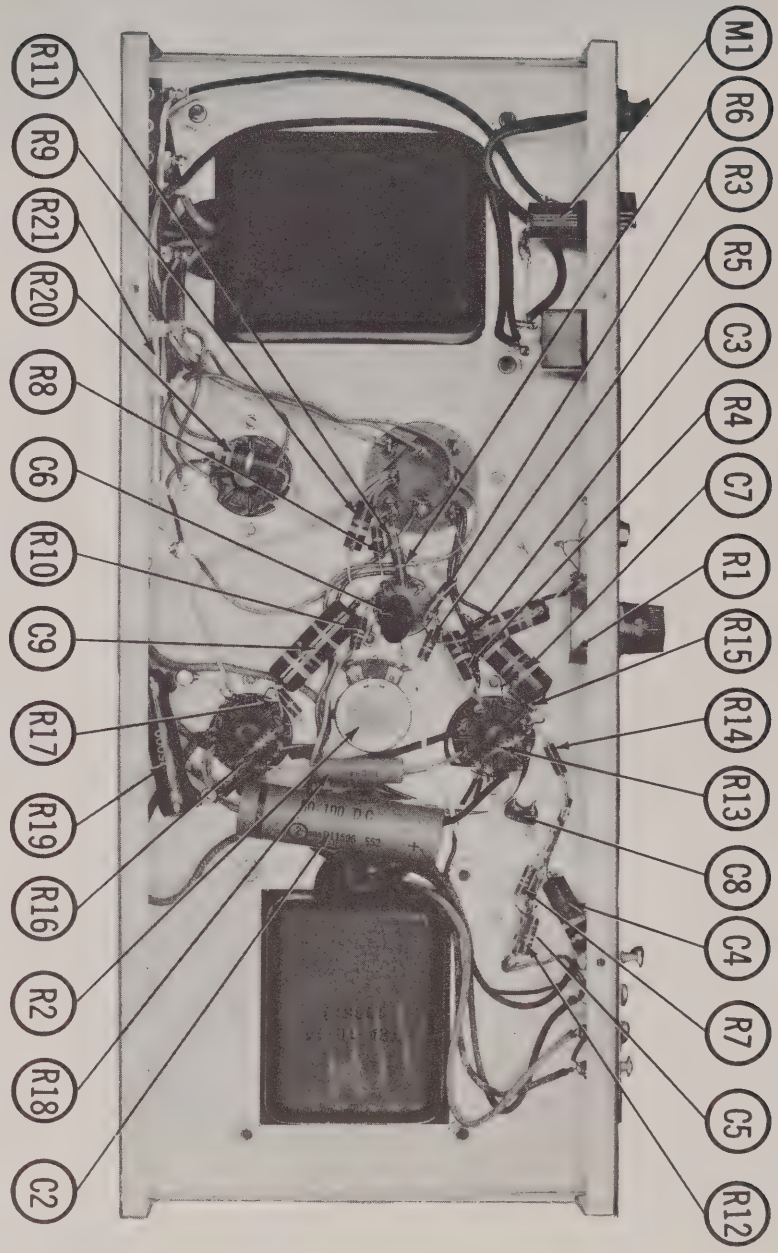
TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	H. H. Scott PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	7300Ω CT	16Ω tap @ 8Ω, 4Ω	TRA-10-14						

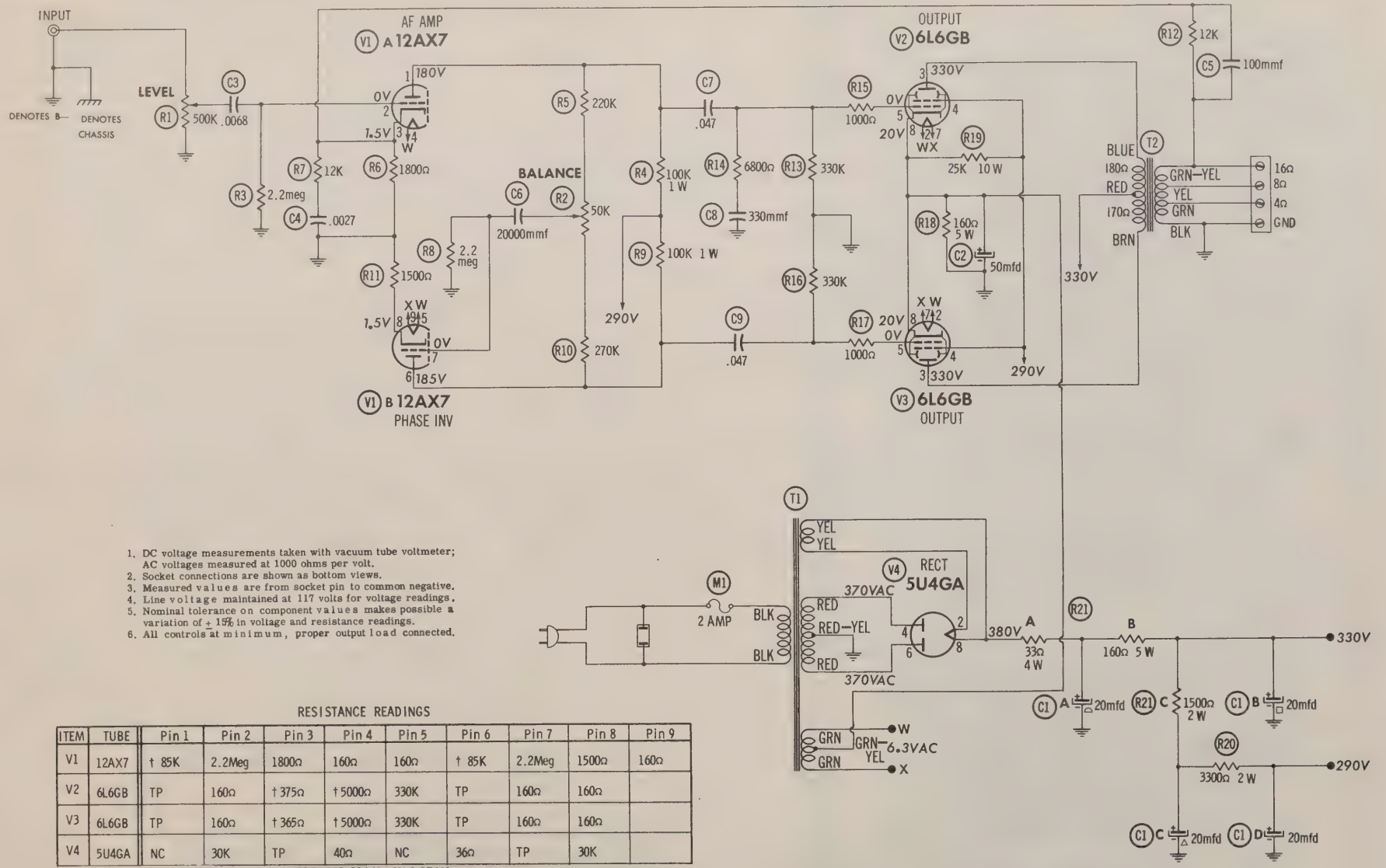
FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			H. H. Scott PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG	2A			313002. (3AG S/B 2A)	342003.	MDL2	HKP

CHASSIS—BOTTOM VIEW



H. H. SCOTT MODEL 223



1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AX7	† 85K	2.2Meg	1800Ω	160Ω	160Ω	† 85K	2.2Meg	1500Ω	160Ω
V2	6L6GB	TP	160Ω	†375Ω	†5000Ω	330K	TP	160Ω	160Ω	
V3	6L6GB	TP	160Ω	†365Ω	†5000Ω	330K	TP	160Ω	160Ω	
V4	5U4GA	NC	30K	TP	40Ω	NC	36Ω	TP	30K	

† MEASURED FROM PIN 8 OF V4.
NC NO CONNECTION.
TP TIE POINT.

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TRUETONE
MODELS 2D1715A, 2D1716A

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TRUETONE
MODELS 2D1715A, 2D1716A

TRUETONE MODEL 2D1716A

TRADE NAME	Truetone Models 2D1715A, 2D1716A
SUPPLIER	Western Auto Supply Co., 2107 Grand Ave., Kansas City, Mo.
TYPE SET	Television Receiver
TUBES	Sixteen
POWER SUPPLY	105-115 Volts AC-60 Cycles RATING 1.4 Amp. @ 115 Volts AC
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)

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RETMA MEMBER

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 7 push-on type control knobs from front panel of cabinet.

2. Remove 13 metal screws. Remove rear cover.

3. Remove picture tube socket, HV lead, yoke leads and speaker leads.

4. Remove 4 metal screws securing front grille plate and remove 2 metal screws now exposed by removal of grille plate.

5. Remove 2 metal screws holding antenna-interlock bracket.

6. Remove 2 chassis mounting bracket screws securing bracket to side of cabinet.

7. Remove chassis from cabinet.

8. Remove 4 wood screws holding speaker. Remove speaker from cabinet.

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

MODELS

2D1715A, 2D1716A

TRUETONE
MODELS 2D1715A, 2D1716A

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the VHF tuner oscillator circuit may be accomplished by removal of the channel selector and fine tuning knobs.

PICTURE TUBE SAFETY GLASS CLEANING

Remove 4 wood screws holding wood molding at the top edge of the safety glass. Remove molding and safety glass. Use extreme caution when removing safety glass.

SERVICE ADJUSTMENT LOCATION

See tube placement chart on page 5.

FOCUS

Adjust ion trap for best focus consistent with maximum brightness.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

For adjustment of the horizontal oscillator it is necessary to remove the rear cover and supply power to the chassis Adjustment is located on top of the chassis. Set the horizontal hold control at the center of its range and adjust the horizontal frequency slug (L29) until the picture synchronizes horizontally.

FUSES

A 9Ω fusible resistor R92 is used for LV power supply protection.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the buzz control located on top of chassis for maximum sound and MINIMUM buzz.

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

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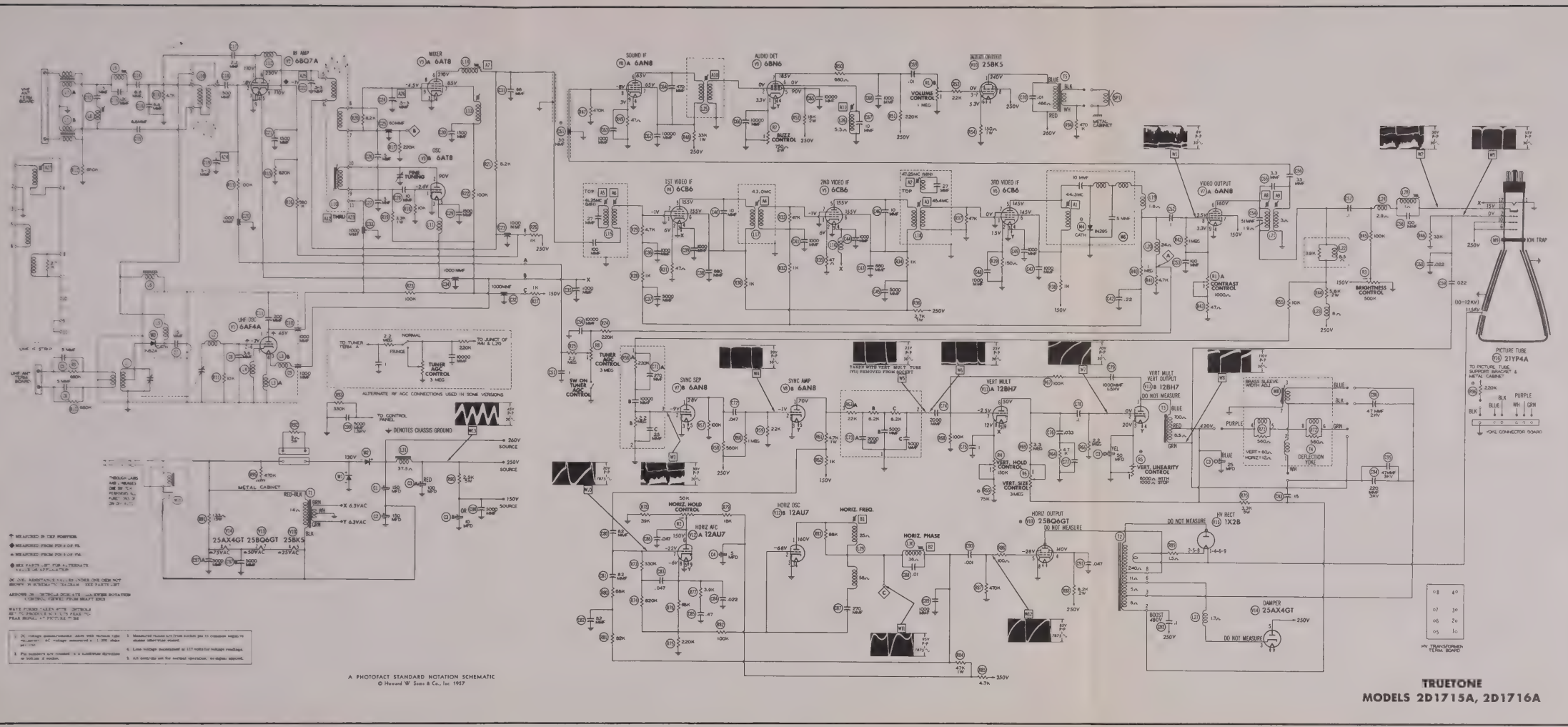

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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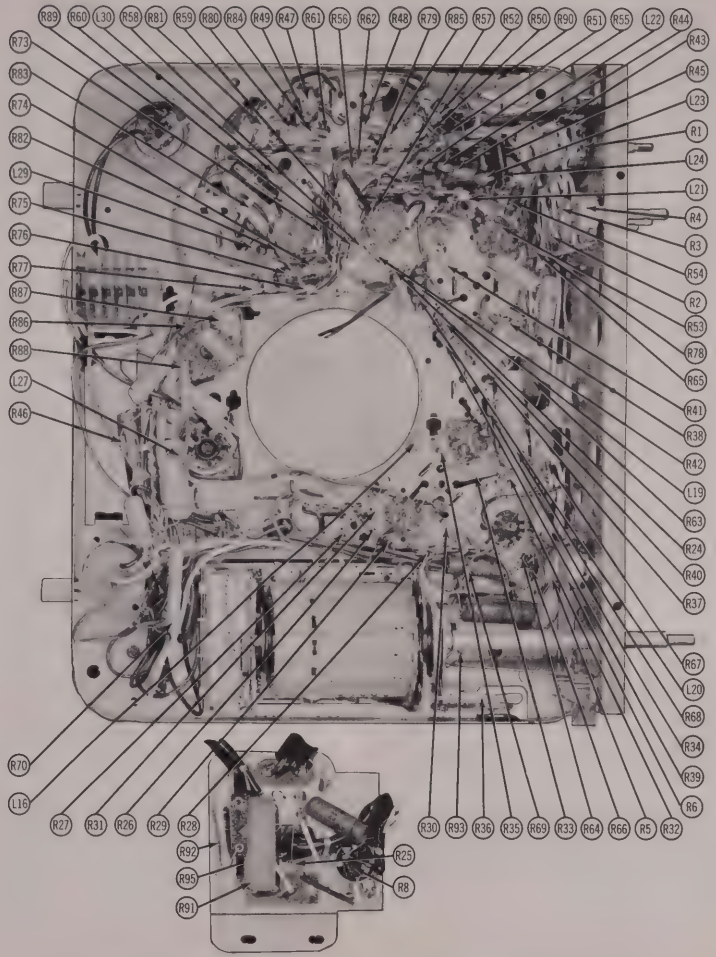
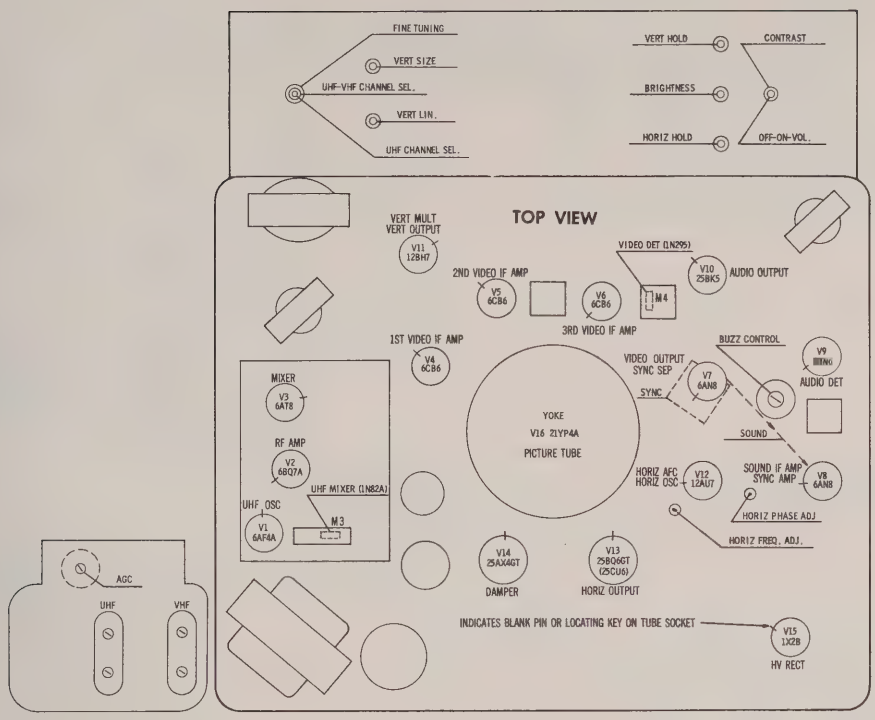
TRUETONE
MODELS 2D1715A, 2D1716A

TRUETONE
MODELS 2D1715A, 2D1716A



CHASSIS BOTTOM VIEW-RESISTOR AND INDUCTOR IDENTIFICATION

TUBE PLACEMENT CHART



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L. F. BLANKENSHIP
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DENVER, COLORADO

TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

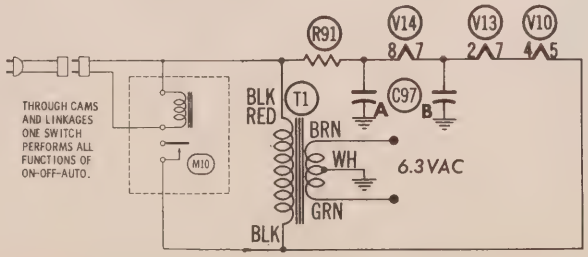
POWER SUPPLY FAILURE
No raster, no sound - **Selenium Rectifiers (M1 & M2)**

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - **V3, V4, V5, V6, V7 (V1 UHF only)**
No pic, no sound, has snow - **V2, V3, V4**
No pic, has sound, has raster - **V7, V16**
Has pic, no sound - **V8, V9, V10**

SYNC FAILURE
No vert. sync - **V8, V11**
No horiz. sync - **V8, V12**
No vert. or horiz. sync - **V7, V8**

SWEEP FAILURE
No raster, has sound - **V12, V13, V14, V15, V16**
No vertical deflection - **V11**
Poor vert. linearity or foldover - **V11**
Poor horiz. linearity or foldover - **V12, V13, V14**
Narrow picture - **V12, V13, V14, V15, M1, M2**
Vert. off freq. - **V8, V11**
Horiz. off freq. - **V8, V12**

NOTE: Since this receiver employs tubes used in a series-parallel filament network, an open filament in any tube in series may cause the set to be inoperative (See circuit below).



ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use an isolation transformer to protect the test equipment.
The high voltage lead should be securely taped away from the chassis.

VIDEO IF ALIGNMENT

Connect a .001MFD capacitor across the vertical amplifier terminals of the oscilloscope.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizonal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	.001MFD	High side to pin 1 (grid) of 6CB6 (V4). Low side to chassis.	Not used	44.3MC (Unmod)	10	Use VTVM. DC probe to point (A). Common to chassis.	A1	Attenuate signal generator to maintain not more than 2 volts at VTVM. Adjust for maximum deflection.
2.	"	"	"	47.25MC	"	"	A2	Adjust for MINIMUM deflection.
3.	"	"	"	45.4MC	"	"	A3	Attenuate signal generator to maintain not more than 2 volts at VTVM. Adjust for maximum deflection.
4.	"	"	"	43.0MC	"	"	A4	"
5.	"	"	43.5MC (10MC Swp)	42.5MC 45.6MC	"	Vert. Amp. thru 10KΩ to point (A). Low side to chassis.		Use only enough sweep generator output to provide usable pattern on scope. Check for response curve similar to Fig. 1. If necessary retouch A1, A3 and A4 for desired response. Adjust A1 for MINIMUM tilt. A3 affects high frequency side of response curve. A4 affects low frequency side of curve.
6.	Direct	High side to ungrounded tube shield floating over converter tube. Low side to chassis.	Not used	41.25MC	"	USE VTVM. DC probe to point (A). Common to chassis.	A5	Adjust for MINIMUM deflection.
7.	"	"	43.5MC (10MC Swp)	42.5MC 45.6MC	"	Vert. Amp. thru 10KΩ to point (A). Low side to chassis.	A6, A7	Adjust A6 and A7 for response similar to Fig. 2. If necessary, slightly retouch A1 for MINIMUM tilt, A3 for position of 45.6MC marker and A4 for position of 42.5MC marker.

SOUND IF ALIGNMENT

Restore the receiver to normal operating condition. Tune in a TV signal and adjust the fine tuning control until sound bars just appear in the picture. Adjust A8 slug counter clockwise from the coil turns. Then clockwise until the scanning lines are smooth and continuous. Readjust the fine tuning for the clearest picture and best sound.
Insert an attenuator in series with the antenna and the receiver antenna terminals so that the signal strength may be varies from weak to strong. If a suitable attenuator is not available, stray feed the signal to the receiver by placing the antenna lead-in near the antenna terminals. Reduce the signal input to the receiver so that the signal falls below the limiting level of the 6BN6 as evidenced by a hiss in the sound. Adjust the secondary of the sound take-off transformer (A9), the sound IF transformer (A10), the quadrature coil (A11) and the buzz control (R7) for maximum sound and minimum buzz. If the hiss disappears while adjusting, increase attenuation until hiss reappears.

VHF OSCILLATOR ALIGNMENT

Connect the negative lead of a 1.5 volt bias battery to the tuner AGC. Connect the positive lead to chassis.
The channel oscillator adjustment screws are reached thru a hole just to the left of the channel switch shaft. The correct adjustment screw is accessible thru this hole as the channel switch is turned to each channel.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
9.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	213MC (10MC Swp)	211.25MC 215.75MC	13	Vert. Amp. thru 10KΩ to point (A). Low side to chassis.	A12	Adjust to place sound marker in trap notch as in Fig. 3. Video marker should fall at 50%.
			207MC (10MC Swp)	205.25MC 209.75MC	12		A13	
			201MC (10MC Swp)	199.25MC 203.75MC	11		A14	
			195MC (10MC Swp)	193.25MC 197.75MC	10		A15	
			189MC (10MC Swp)	187.25MC 191.75MC	9		A16	
			183MC (10MC Swp)	181.25MC 185.75MC	8		A17	
			177MC (10MC Swp)	175.25MC 179.75MC	7		A18	
			85MC (10MC Swp)	83.25MC 87.75MC	6		A19	
			79MC (10MC Swp)	77.25MC 81.75MC	5		A20	
			69MC (10MC Swp)	67.25MC 71.75MC	4		A21	
			63MC (10MC Swp)	61.25MC 65.75MC	3		A22	
			57MC (10MC Swp)	55.25MC 59.75MC	2		A23	

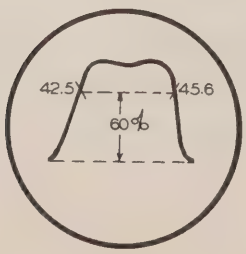


FIG.1

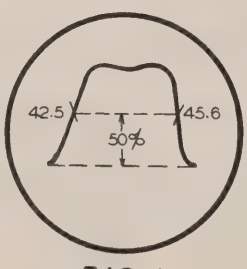


FIG. 2

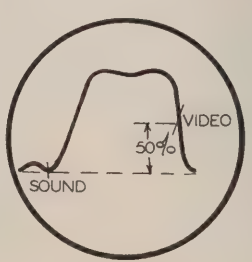


FIG. 3

ALIGNMENT INSTRUCTIONS (cont)

VHF RF AND MIXER ALIGNMENT

Connect the bias as under "VHF Oscillator Alignment".
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
10.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	207MC (10MC Swp)	205.25MC 209.75MC	12	Vert. Amp. thru 10KΩ to point (B). Low side to chassis.	A24, A25, A26	Adjust for response curve similar to Fig. 4 with markers above 90%.
11.	"	"	213MC (10MC Swp)	211.25MC 215.75MC	13	"		Check for response similar to Fig. 4. If markers fall below 70% on any channel, make compromise adjustments of A24, A25 and A26 with channel switch set to that channel. Check all other channels to see that they have not been seriously affected.
			201MC (10MC Swp)	199.25MC 203.75MC	11			
			195MC (10MC Swp)	193.25MC 197.75MC	10			
			189MC (10MC Swp)	187.25MC 191.75MC	9			
			183MC (10MC Swp)	181.25MC 185.75MC	8			
			177MC (10MC Swp)	175.25MC 179.75MC	7			
			85MC (10MC Swp)	83.25MC 87.75MC	6			
			79MC (10MC Swp)	77.25MC 81.75MC	5			
			69MC (10MC Swp)	67.25MC 71.75MC	4			
			63MC (10MC Swp)	61.25MC 65.75MC	3			
			57MC (10MC Swp)	55.25MC 59.75MC	2			

UHF TUNER ALIGNMENT

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
12.	Two 120Ω Carbon Resistors	Across UHF antenna terminals with 120Ω in each lead.	600MC (10MC Swp)		35	Vert. Amp. thru 10KΩ to point (A). Low side to chassis.	A27	Use only enough sweep generator output to provide usable pattern on scope. Adjust A27 for response similar to Fig. 5.
13.	"	"	470MC		14	"		Response curve should have tilt similar to Fig. 6.
14.	"	"	870MC		80	"		Response curve tilt should be similar to Fig. 7. Tilts on response curves in steps 12 and 13 should be approximately equal. If not, retouch A27 until they are equal.

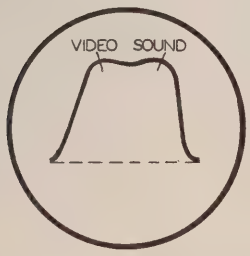


FIG.4

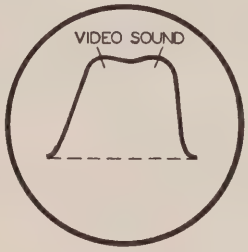


FIG.5

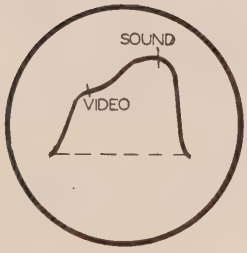


FIG.6

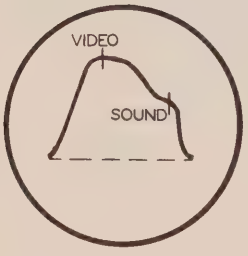
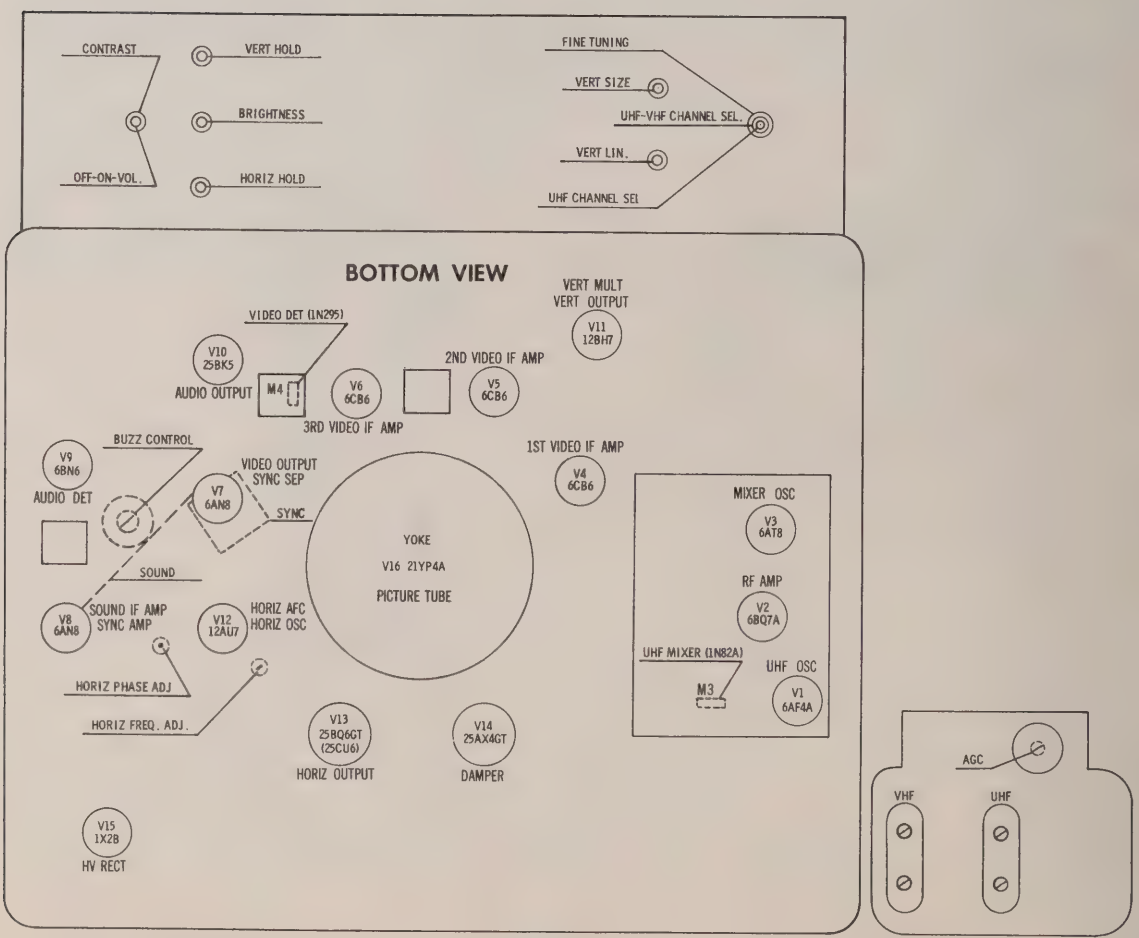


FIG.7

RESISTANCE MEASUREMENTS

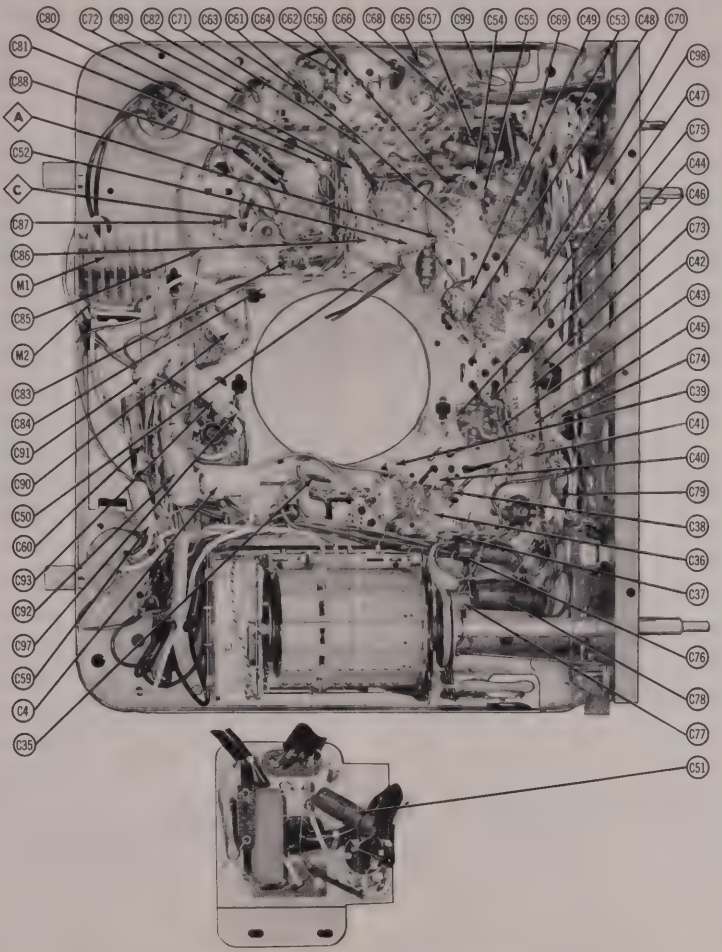
Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6AF4A	*† 6.8KΩ	10KΩ	.1Ω	0Ω	0Ω	10KΩ	*† 6.8KΩ		
V 2	6BQ7A	INF	2.5Meg	0Ω	0Ω	.1Ω	† 1KΩ	300KΩ	INF	0Ω
V 3	6AT8	10KΩ	† 6.8KΩ	0Ω	0Ω	.1Ω	† 8.3KΩ	† 100KΩ	0Ω	220KΩ
V 4	6CB6	1Meg	47Ω	0Ω	.1Ω	† 3.7KΩ	† 3.7KΩ	0Ω		
V 5	6CB6	1Meg	47Ω	0Ω	.1Ω	† 3.7KΩ	† 3.7KΩ	0Ω		
V 6	6CB6	.1Ω	150Ω	0Ω	.1Ω	† 3.5KΩ	† 3.5KΩ	0Ω		
V 7	6AN8	† 100KΩ	2.2Meg	0Ω	0Ω	.1Ω	† 5.6KΩ	† 2.5KΩ	1Meg	120Ω
V 8	6AN8	† 8.2KΩ	22KΩ	0Ω	0Ω	.1Ω	† 33KΩ	† 33KΩ	470KΩ	47Ω
V 9	6BN6	350Ω	.4Ω	0Ω	.1Ω	† 18KΩ	5.3Ω	† 220KΩ		
V 10	25BK5	† 486Ω	TP	500KΩ	# 10Ω	# 0Ω	150Ω	500KΩ	† 38Ω	TP
V 11	12BH7	▲ 4KΩ	2.2Meg	1.2KΩ	.1Ω	.1Ω	▲ 5Meg	100KΩ	100KΩ	1.5Ω
V 12	12AU7	† 50KΩ	300KΩ	0Ω	0Ω	0Ω	† 30KΩ	1.5Meg	280KΩ	.1Ω
V 13	25BQ6GT	TP	# 20Ω	TP	† 8.2KΩ	470KΩ	TP	# 10Ω	0Ω	TOP CAP ▲ 13Ω
V 14	25AX4GT	TP	NC	100KΩ	NC	† 38Ω	TP	# 20Ω	# 30Ω	
V 15	1X2B		PINS	1-8	HAVE	INF	RESISTANCE			TOP CAP ▲ 253Ω
V 16	21YP4A	0Ω	33KΩ	PIN 6 † 38Ω	PIN 10 † 38Ω	PIN 11 † 150KΩ	PIN 12 .1Ω			

* MEASURED IN "UHF" POSITION.
† MEASURED FROM OUTPUT OF M2.
▲ MEASURED FROM PIN 3 OF V14.
MEASURED FROM PIN 5 OF V10.
TP-TIE POINT.
NC-NO CONNECTION.

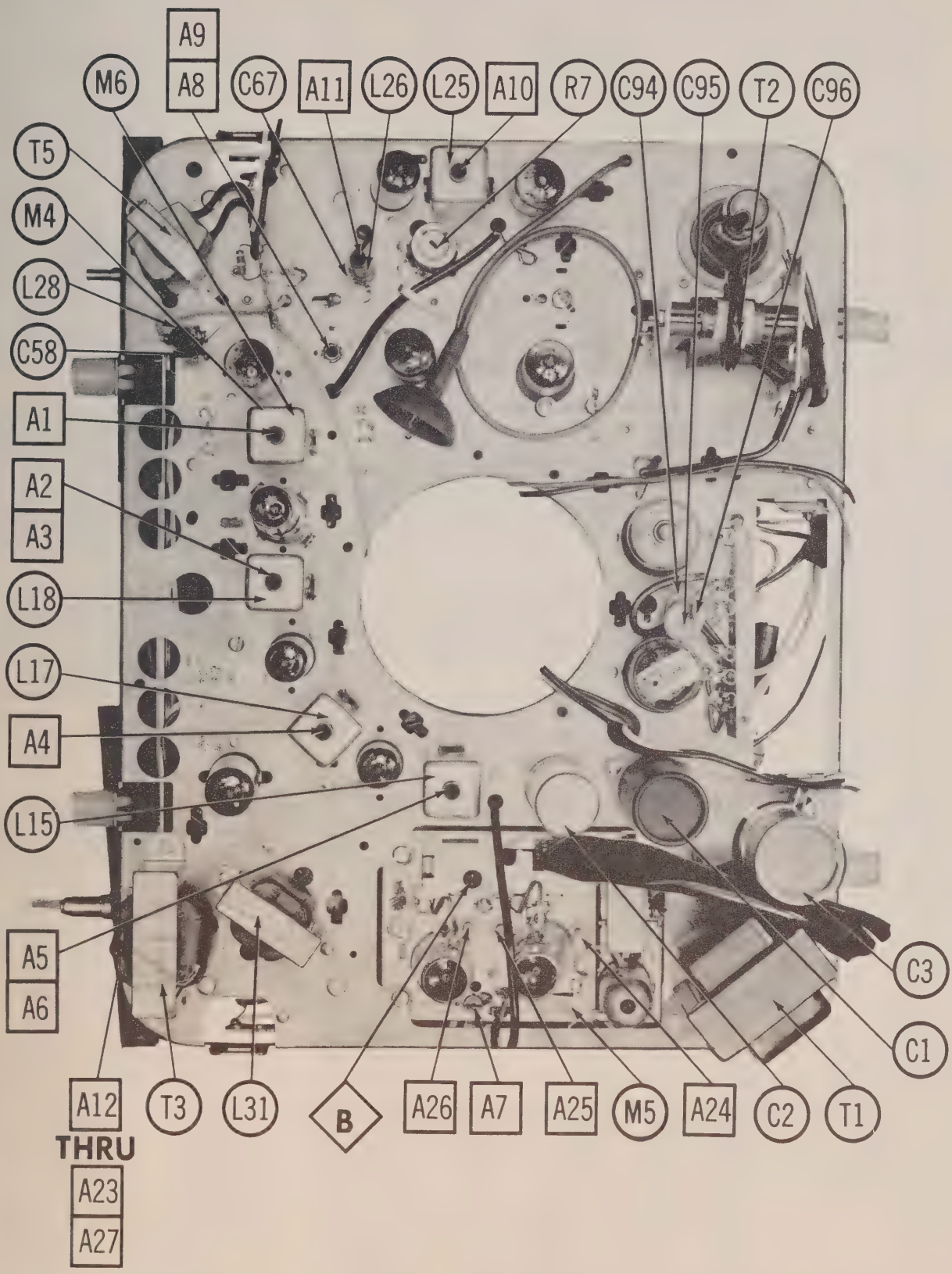


TUBE PLACEMENT CHART

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO



CHASSIS BOTTOM VIEW-CAPACITOR AND ALIGNMENT IDENTIFICATION



CHASSIS TOP VIEW

SET 349 FOLDER 12

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No	USE	TYPE	NOTES
V1	URF Oscillator	6AF4A	
V2	RF Amplifier	6BQ7A	
V3	Mixer-Oscillator	6AT8	
V4	1st Video IF Amplifier	6CB6	
V5	2nd Video IF Amplifier	6CB6	
V6	3rd Video IF Amplifier	6CB6	
V7	Video Output-Sync Sep.	6AU8	
V8	Sound IF Amp -Sync Amp	6AN8	

Note 1. 25CU8 may be used in some versions.

PICTURE TUBE

ITEM No	REPLACEMENT DATA: G.E. PART No.	G.E. RENTAL PART No.	SYLVANIA PART No.	NOTES
V19	21YP4A ①	1YP4A ①	21YP4A ②	① Aluminized
	21YP4	21YP4	21YP4 ②	② Silver screen 65°

ELECTROLYTIC CAPACITORS

ITEM No	RATING: CAP	VOLT	REPLACEMENT DATA: TRUETONE PART No	AEROVOX DUBILIER PART No	CORNELL DUBILIER PART No	MALLORY PART No	PYRAMID PART No	SANGAMO PART No	SPRAGUE PART No	NOTES
C1	35	50	BC-22464	AFRS-21	AA2-25	FP41	TMS 25	T-050	TVL-1428	
C2	200	50	BC-22463	AFRS-21	AA2-25	FP41	TMS 25	T-050	TVL-1428	
C3	100	50	BC-25309	AP14-10880	DCS08	WQ035		Q-310	RJ194 *	
D 1C		300						MTD-4320		
D 2C		300								
D 3		50								
C4	2	300	BC-24174	PRS330V4	BR435	TC60	TD-8-350	FM-3508	TVA-1601	

* Unit must be ordered from MFgr

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No	RATING: CAP	VOLT	REPLACEMENT DATA: TRUETONE Part No.	AEROVOX	CENTRALAB	CORNELL DUBILIER PART No.	ERIE	MALLORY	SPRAGUE PART No.	NOTES
C5	5		1005-34349	828	BD-050	GS11	831-050	ST-555	5GA-Y5	
C6	5		1005-34349	828	BD-050	GS11	831-050	ST-555	5GA-Y5	
C7	.5		1075-25749							
C8	3.5		1075-25750							
C9	1000		1075-25742							
C10	.000		1075-25742							
C11	100		1075-25751							
C12	5		1075-25740							
C13	250		1075-25741	BPD-0001S	BD-151	G044	811-151	UC-5312	5GA-T12	
C14	6.5		1075-25738	MPG-DS5.5	TCZ-CR5	ZG13	MPGA-CR5	ST-5569	5TCCB-V56	
C15	6.5		1075-25738	MPG-DS5.5	TCZ-CR5	ZG13	MPGA-CR5	ST-5569	5TCCB-V56	
C16	6.5		1075-25738	MPG-DS5.5	TCZ-CR5	ZG13	MPGA-CR5	ST-5569	5TCCB-V56	
C17	3.3		1075-25747	MPG-S13.3	TCZ-CR3	ZG06	MPGA-CR3		5TCCB-V32	
C18	1000		1075-25743	BPD-0015	BD-123	KD71	801-0015	UC-5315	5HK-D15	
C19	5.3		1005-25323		833-3		311S-01-CR5	CT565A		
C20	1000		1075-25743							
C21	1000		1075-25743	BPD-0015	BD-123	KD71	801-0015	UC-5315	5HK-D15	
C22	5.3		1005-25323		833-3		311S-01-CR5	CT565A		
C23	5000		1075-25743							
C24	5.3		1005-25323		833-3		311S-01-CR5	CT565A		
C25	68		1075-25743							
C26	.5		1075-25744		TCZ-R5	TZ01	MPGA-CR5			
C27	5		1005-24249							
C28	30		1075-25746							
C29	1500		1075-25753	BPD-0015	BD-123	KD71	801-0015	UC-5315	5HK-D15	
C30	1000		1075-25743	BPD-0015	BD-123	KD71	801-0015	UC-5315	5HK-D15	
C31	56			M756-D559	TCN-05	N055	M750L-680		5TCU-Q68	
C32	1000		1075-25743							
C33	1000		1075-25743							
C34	1000		1075-25743							
C35	10000			BPD-01	BD-163	KD63	811-01	DC-511	5HK-S1	
C36	1000			BPD-001	BD-152	KD66	801-001	DC-521	5HK-D1	
C37	5000			BPD-005	BD-162	KD69	801-005	DC-525	5HK-D5	
C38	680			S5680	DS-561	TP50	GPSK-S81	UC-5368	5GA-T68	
C39	1000			BPD-001	BD-152	KD66	801-001	DC-521	5HK-D1	
C40	10			M750-S20	TCN-10	TN01	MT50L-100	NT-541	5TCU-T1	
C41	1000			BPD-001	BD-152	KD66	801-001	DC-521	5HK-D1	
C42	.33	300		PSA5N-33		TC1SUB33		PT4033	5TM-P33	
C43	680			S5680	DS-561	TP50	GPSK-S81	UC-5368	5GA-T68	
C44	1000			BPD-001	BD-152	KD66	801-001	DC-521	5HK-D1	
C45	5000			BPD-005	BD-162	KD69	801-005	DC-525	5HK-D5	
C46	10			M750-S20	TCN-10	TN01	MT50L-100	NT-541	5TCU-T1	
C47	1000			S2000	DS-102	TP53	GP2L-102	UC-531	5HK-D1	
C48	1000			S2000	DS-102	TP53	GP2L-102	UC-531	5HK-D1	
C49	1000			BPD-001	BD-152	KD66	801-001	DC-521	5HK-D1	
C50	10000			BPD-01	BD-163	KD63	811-01	DC-511	5HK-S1	
C51	.1	300		PSA5N-1	DF-104	CU5SP1		PT401	5TM-P1	
C52	.1	300		PSA5N-1	DF-104	CU5SP1		PT401	5TM-P1	
C53	100			S100	DS-101	TP54	GP1K-101	UC-531	5GA-T1	
C54	5.3			M75-S13.3	TCZ-3R3	TZ06	MPGA-3R3	ST-5533	5TCCB-V33	
C55	3.3			M75-S3.3	TCZ-3R3	TZ16	MPGA-3R3	ST-5533	5TCC-Q33	
C56*	.1	600		P468K-1	DF-104	CU5AP1		PT401	5TM-P1	
C57	100			M75-S100	DS-101	TP53	801-101	MC1S515	5GA-T1	
C58	.022	600		BPD-03	BD-303	CU5AS22	617-03	PT5122	5TM-S22	
C59	.022	300		BPD-03	BD-303	CU5BS22	617-03	PT5122	5TM-S22	
C60	30		163-32772							Note 1
C61	10000			BPD-01	BD-163	KD63	811-01	DC-511	5HK-S1	
C62	1000			BPD-001	BD-152	KD66	801-001	DC-521	5HK-D1	
C64	470			1469-00047	DS-471	SR57N7	811-471	MC3S45	5M-347	
C65	1000			BPD-01	BD-163	KD63	811-01	DC-511	5HK-S1	
C66	10000			BPD-01	BD-163	KD63	811-01	DC-511	5HK-S1	
C67	10			M75-S10	TCZ-10	TZ09	MPGA-100	ST-541	5TCC-Q1	
C68	1000			BPD-001	BD-152	KD66	801-001	DC-521	5HK-D1	
C69	.01	600		BPD-01	DE-103	CU5AS1	GP3-333-103	PT511	5TM-S1	
C70	.01	600		BPD-01	DE-103	CU5BS1	GP3-333-103	PT511	5TM-S1	
C71A	270		178-34232	1PA535	1PC-383	[TP41	GPIK-271	UC-5327	5GA-T27	
B	30000					KD63	811-01	DC-511	5HK-S1	
C	25					TP35	GPIK-250	UC-5435	5GA-Q25	
C72	.047	300		BPD-06	DF-503	CU5BS47		PT4147	5TM-S47	
C73A	3000							UC-5323		
B	5000		47A-32270	4PA-D8	4PC-100	4115TM1	4440S-01	DC-525	4V-1	
C	5000							DC-535		
C74	3000			S2000	DS-302	TP56	GP3-333-302	UC-523	5HK-D2	

PARTS LIST AND DESCRIPTIONS

CAPACITORS (cont)

ITEM No	RATING: CAP	VOLT	REPLACEMENT DATA: TRUETONE PART No	AEROVOX PART No	CENTRALAB PART No	CORNELL DUBILIER PART No	ERIE PART No	MALLORY PART No	SPRAGUE PART No	NOTES
C75	1	200		P288N-1	DF-104	CU5EP1		PT401	2TM-P1	
C76	.033	400		BPD-03	DF-303	CL3S633		PT3133	6TM-S33	
C77	1	200		P288N-1	DF-104	CU5EP1		PT401	2TM-P1	
C78	1	400		P468N-1	DF-104	CU5AP1		PT401	4TM-P1	
C79	1000	1500	8G-24991	HVD-15-4000	DD30-103	MCDI	1R5KV-102	DC3091	20GA-D1	
C80	82			1469-00082	DE-820	SR5Q82	801-820		MS-482	
C81	82			1469-00082	DE-820	SR5Q82	801-820		MS-482	
C82	82			1469-00082	DE-820	SR5Q82	801-820		MS-482	
C83	047	300		BPD-05	DF-503	CU5BS47		PT4147	3TM-S47	
C84	022	300		BPD-02	DD-203	CU5BS22	817-02	CUB4S22	2TM-S22	
C85	47	300		P288N-47		CU5BP47		PT4047	2TM-P47	
C86	047	400		BPD-05	DF-503	CU5AS47		PT4147	4TM-S47	
C87	270			1469-00027	DE-271	SR57Z7	811-271	MC8Z41	M8-Z37	
C88	01	600								
C89	1000			1464-001		1R5DI	811-103	MC3S55	M8-Z1	
C90	001	600		S2000	DE-102	CU5MD1	GP3L-102	PT631	6TM-D1	
C91	047	400		BPD-05	DF-503	CU5AS47		PT4147	4TM-S47	
C92	047	300		P468N-1	DF-104	CU5EP1		PT401	4TM-P1	
C93	15	200		P288N-15		CU5EP15		PT4015	2TM-P15	
C94	220	3000	8G-24992	HVD-30-220	DD30-221	Y3T22	3KV-221	DC30332	30GA-T22	
C95	47	3000	8G-24926	HVD-30-47	DD30-470	V3Q47	3KV-470	DC30447	30GAB-Q47	
C96	47	3000	8G-23845	HVD-30-47	DD30-470	V3Q47	3KV-470	DC30447	30GAB-Q47	
C97A	5000	1500		BPD-2X5047	DD2-502	DX2T19	811-001	DC-525	5HK-D247	
B	5000						811-005	DC-525		
C98	5000			BPD-005	DD-502	KD80	811-005	DC-525	5HK-D5	
C99	5000	1500		HVD-15-4700			1R5KV-472		20HK-D5	

Note 1. Shielded sound IF coupling lead.
† Items C71A, C71B, C71C, R48A and R56D are combined in one unit.
* Items C73A, C73B, C73C, R63A, R63B and R63C are combined in one unit.

CONTROLS

ITEM No	RATING: RESISTANCE	WATTS	REPLACEMENT DATA: TRUETONE PART No	CENTRALAB PART No	CLAROSTAT PART No	IRC PART No	MALLORY PART No	INSTALLATION NOTES
R1A	1000Ω		B10A-23714	F1-4	*RTV 486	* QJ-734	UF13L	Contrast (Panel)
B	1 Meg			R2-52			UR16A	Volume (Rear)
R2A	50KΩ	1	B10B-23297	AB-31	A47-50K-S	Q11-123	TA54L	Horiz. Hold
B	Shaft		Not Req.	AK-4	KS5-3	Not Req.	Not Req.	
R3A	500KΩ		B10B-23295	AB-59	A47-500K-S	Q11-133	TA53L	Brightness
B	Shaft		Not Req.	AK-4	KS5-3	Not Req.	Not Req.	
R4A	150KΩ		B10B-23296	AB-43	A47-150K-S	Q11-129	TA194L	Vert. Hold
B	Shaft		Not Req.	AK-4	KS5-3	Not Req.	Not Req.	
R5A	500KΩ	1	B10B-23407	* AB-10	* A47-500K-S	* Q11-114	* TA53L	Vert. Linearity
	with 1000Ω stop							
B	Shaft		Not Req.	AK-1	FKS-1	RQ	Not Req.	
R6A	3Meg	1	B10B-23696	AB-54	A47-3Meg-S	Q11-140	TA36L	Vert. Size
B	Shaft		Not Req.	AK-1	FKS-1	RQ	Not Req.	
R7	750Ω	2	A10D-23857		79-750			Buss-Wire Wound
R8A	3Meg	1	B10A-25667	B-54-S	A47-3Meg-S	Q11-140	U-59	Tuner AGC
B	Shaft		Not Req.	AK-1	KS5-3	Not Req.	Not Req.	
C	Switch		Not Req.		SWE-12	78-1	US-28	

* Switch not required.
+ Connect a 100Ω resistor in series with the right hand terminal of the control and the lead connecting to the same terminal of the original control (control viewed from shaft end, terminals down).

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No	RATING: OHMS	WATT	REPLACEMENT DATA: TRUETONE PART No.	IRC PART No.	NOTES
R9	680KΩ			BTS-680K	
R10	680KΩ			BTS-680K	
R11	0KΩ				
R12	680KΩ			BTS-680K	
R13	100KΩ			BTS-100K	
R14	4700Ω			BTS-4700	
R15	820KΩ			BTS-820K	
R16	560KΩ			BTS-560K	
R17	220KΩ			BTS-220K	
R18	10KΩ				
R19	3300Ω	1		BTA-3300	
R20	820Ω				
R21	820Ω				
R22	100KΩ				
R23	100KΩ			BTS-100K	
R24	220KΩ			BTS-220K	
R25	2.2Meg			BTS-2.2Meg	
R26	1000Ω			BTS-1000	
R27	1000Ω			BTS-1000	
R28	1000Ω			BTS-1000	
R29	4700Ω				
R30	1000Ω			BTS-1000	
R31	47Ω			BTS-47	
R32	1000Ω			BTS-1000	
R33	47KΩ			BTS-47K	
R34	1000Ω			BTS-1000	
R35	47Ω			BTS-47	
R36	2700Ω	3	9C11-1104		
R37	47KΩ			BTS-47K	
R38	1000Ω			BTS-1000	
R39	150Ω			BTS-150	
R40	1Meg			BTS-1Meg	
R41	4700Ω			BTS-4700	
R42	1Meg			BTS-1Meg	
R43	47Ω			BTS-47	
R44	5600Ω	2		BTS-5600	
R45	100KΩ			BTS-100K	
R46	33KΩ			BTS-33K	
R47	470KΩ			BTS-470K	
R48	33KΩ	1		BTA-33K	
R49	47Ω			BTS-47	
R50	680Ω			BTS-680	
R51	220KΩ			BTS-220	

ITEM No	RATING: OHMS	WATT	REPLACEMENT DATA: TRUETONE PART No.	IRC PART No.	NOTES
R52	18KΩ	2		BTA-18K	
R53	22KΩ			BTS-22K	
R54	150Ω	1		BTA-150	
R55	10KΩ			BTS-10K	
R56A	100KΩ		† 17A-34212	BTS-330K	
B	2.33Meg			BTS-2.33Meg	
R57	100KΩ			BTS-100K	
R58	560KΩ			BTS-560K	
R59	33KΩ			BTS-33K	
R60	1Meg			BTS-1Meg	
R61	4700Ω	1		BTA-4700	
R62	1000Ω			BTS-1000	
R63A	33KΩ			BTS-33K	
B	8200Ω		41A-32276	BTS-8200	
C	8200Ω	2		BTS-8200	
R64	4700Ω			BTS-4700	
R65	75KΩ 5%			BTS-75K 5%	Note 1
R66	2.2Meg			BTS-2.2Meg	
R67	100KΩ			BTS-100K	
R68	100KΩ			BTS-100K	
R69	3.3Meg			BTS-3.3Meg	
R70	330Ω	5	9C13-1106	PWT-3300	
R71	[illegible]				
R72	5KΩ				
R73	330KΩ				
R74	820KΩ				
R75	220KΩ				
R76	68KΩ			BTS-68K	
R77	3900Ω			BTS-3900	
R78	39KΩ				
R79	18KΩ			BTS-18K	
R80	68KΩ			BTS-68K	
R81	82KΩ			BTS-82K	
R82	100KΩ			BTS-100K	
R83	68KΩ			BTS-68K	
R84	47KΩ	1		BTA-47K	
R85	4700Ω			BTS-4700	
R86	10KΩ				
R87	470KΩ			BTS-470K	
R88	8200Ω	2		BTS-8200	
R89	1.5Ω		9C1-1005	PWI-1.5	
R90	2500Ω	5	9C-34033	PWT-2500	
R91	133Ω	15	9C-23672		

RESISTORS (cont)

ITEM No	RATING: OHMS	WATT	REPLACEMENT DATA: TRUETONE PART No.	IRC PART No.	NOTES
R93	470KΩ		9BI-39	BTS-470K	
R94	220KΩ			BTS-220K	Note 2

Note 1. Some versions use a 68KΩ 1W resistor in this application.
Note 2. Not used in some versions.
† Items R56A, R56B, C71A, C71B, C71C are combined in one unit.
* Items R63A, R63B, R63C, C73A, C73B, C73C are combined in one unit.

TRANSFORMER (FILAMENT)

ITEM No	RATING: PRI.	SEC. 1	SEC. 2	SEC. 3	REPLACEMENT DATA: TRUETONE Part No	Halldorson Part No	Merit Part No	Stancor Part No	Thordarson Part No	Triad Part No
T1	117VAC	12VCT			12D23699-3	F552B ①	P-2959	P-8130	21F07	
	&/-5%	&/-5%								

① Drill new mounting holes.

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No	USE	REPLACEMENT DATA: TRUETONE Part No	Halldorson Part No	Merit Part No	RCA TYPE No	Ram Part No	Stancor Part No	Thordarson Part No	Triad Part No
T2	Horiz. Output Trans	12E-23939	F6457 *	HVO-58 *		2126 *	HO-25 *	21F80 *	D-71 *
T3	Vert. Output Trans.	12E-23726-1	23304	A-3037	332T1	Y313	A-8123	20S13	A-10DX
T4A	Yoke-Horiz (9.5MH)	20L-24583-K ②	D760L③④	MDP-70④	205D1③④	Y70F06④	DY-8A ④	Y-5③④	Y-LI-1③④
B	Vert. (45MH)	19M-24483 ②							

① 20L-24583-2 Alternate part #
② Yoke rear cover and centering device.
③ Requires new centering device.
④ Use original horizontal yoke damping network.

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type is Listed

ORIGINAL CONNECTIONS	Halldorson Replacement Connections	Merit Replacement Connections	RCA Replacement Connections	Ram Replacement Connections	Stancor Replacement Connections	Thordarson Replacement Connections	Triad Replacement Connections
6	8	8		6	8	8	8
6	8	6		6	6	6	6
3	3	3		3	3	3	3
2	2	2		2	2	2	2

TRANSFORMER (AUDIO OUTPUT)

ITEM No	IMPEDANCE: PRI	SEC	REPLACEMENT DATA: TRUETONE Part No	Halldorson Part No	Merit Part No	Thordarson Part No	Triad Part No	NOTES
T5	6.4KΩ	3-4Ω	12C-23704	Z1113	A-3026	A-3978	24S60	S-7X

SPEAKER

ITEM No.	TYPE: SIZE	FIELD	V C	IMP	REPLACEMENT DATA: TRUETONE Part No	QUAM PART No.	NOTES
SP1	6 1/4"	PM	3-4Ω		18A-25741	52AI	

COILS (RF-IF)

ITEM No.	USE	DC RES.: PRI.	SEC.	REPLACEMENT DATA: TRUETONE Part No.	MEISSNER Part No.	MERIT Part No.	MILLER Part No.	NOTES
L1	URF Mixer Coil	0Ω		107B-25761				Tapped
L2	URF Osc. Coil	0Ω		107B-25764				
L3A	Fil. Choke	0Ω		107B-25766				
B	Fil. Choke	0Ω		107B-25766				
L4	Cathode Choke	0Ω		107B-25765				
L5	URF IF Coil	0Ω		107B-25763				
L6	UHF IF Coil	0Ω		107B-25762				
L7A	VHF Ant. Match. Trans.	0Ω	0Ω					
B	VHF Ant. Match. Trans.	0Ω	0Ω	107B-25754				
L8	IF Trap Coil	2Ω		107B-25757				
L9	IF Trap Coil	0Ω		107B-25756				
L10A	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107B-25755-3				Channel 3
B	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107B-25755-5				Channel 5
C	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107B-25755-4				Channel 4
D	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107B-25755-5				Channel 5
E	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107B-25755-6				Channel 6
F	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107B-25755-7				Channel 7
G	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107B-25755-8				Channel 8
H	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107B-25756-9				Channel 9
I	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107B-25756-10				Channel 10
J	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107B-25755-11				Channel 11

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (cont)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA TRUETONE PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
K	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107S-25755-12				Channel 12
L	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107S-25755-13				Channel 13
M	UHF IF Strip	0Ω		107S-25760				Includes 2.7KΩ resistor
L11	Fil. Choke	0Ω		107S-25767				
L12	Neut. Coil	0Ω		105S-25255				
L13	RF Coil	0Ω		107S-25758				
L14	Conv. Plate	.1Ω		107S-25759				
L15	1st. Video IF			13A-24203				Includes 41.25MC trap
L16	Fil. Choke	0Ω		16A-25688	19-1001		4604	1.5 Microhenries
L17	2nd. Video IF	.1Ω	.1Ω	13A-24224	17-5001 *	TV-125 *	6231 *	
L18	3rd. Video IF	.1Ω	.1Ω	13A-24937	17-5003 *	TV-128 *	6233 *	Includes 47.25MC trap
L19	Series Peaking Coil	1.8Ω		16A-22427	19-1004		4610	7.5 Microhenries
L20	Shunt Peaking Coil	24Ω		16A-21391	19-3300		6155	305 Microhenries
L21A	4.5MC Trap	1.9Ω		201-23729				
B	1st. Sound IF	3Ω						
L22	Series Peaking Coil	8.5Ω		16A-19365	19-4400 ■		6136 ■	410 Microhenries, wound on 3.9KΩ resistor
L23	Shunt Peaking Coil	8Ω		16A-20970	19-3250	TV-185	6130	270 Microhenries
L24	Series Peaking Coil	2.9Ω		16A-24090	19-1005		4612	11 Microhenries
L25	2nd. Sound IF	.4Ω	.4Ω	201-23873				
L26	Quadrature Coil	5.3Ω		201-23727			1480	
L27	RF Choke	1.7Ω		16A-21701	19-1005		4612	8 Microhenries
L28	4.5MC Trap	1Ω		16A-25441				

* Cut out chassis hole and use adaptor plate.
■ Parallel with 3.9KΩ resistor.

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA TRUETONE PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	RCA TYPE No.	Ram PART No.	Thordarson PART No.	NOTES
L29	83Ω		201-24472			6212				Tapped @58Ω-horiz. osc.
L30	36Ω		201-24473-1			6314				Horiz. stabilizer

FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	RATINGS D. C. RESISTANCE	RATINGS INDUCTANCE (0 CURRENT 1000 ∿)	REPLACEMENT DATA TRUETONE PART No.	Halldarson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L31	.200ADC	37.5Ω	.5 HY	16A-23889-1	C5040	C-2994	C-2327	26C41	C-23X

SELENIUM RECTIFIER

ITEM No.	RATING CURRENT	REPLACEMENT DATA TRUETONE PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	NOTES
M1	.230ADC	21J23840	1236A	MR300	6S300	6Q4	300	
M2	.230ADC	21J23840	1236A	MR300	6S300	6Q4	300	

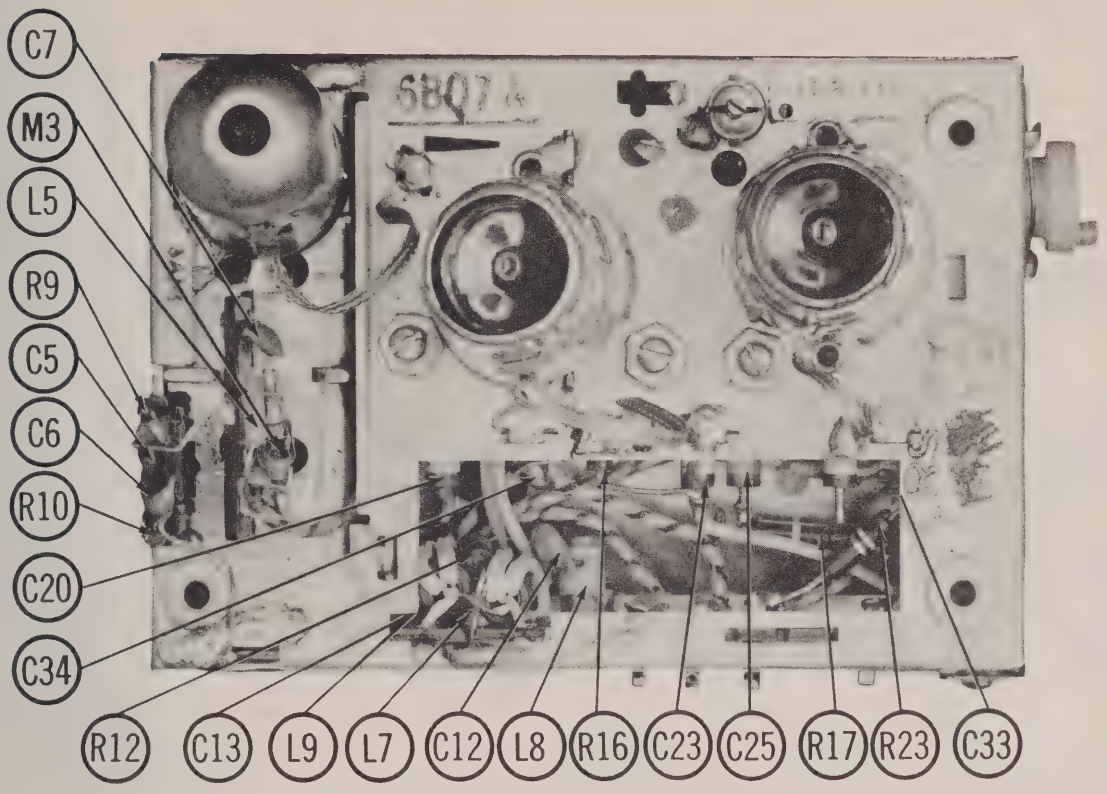
CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA TRUETONE PART No.	REPLACEMENT DATA SYLVANIA PART No.	NOTES
M3	1N82A	31K-111	1N82A	UHF Mixer (Clip-in)
M4	1N295*	1N60	1N60	Video Detector (Pigtail)

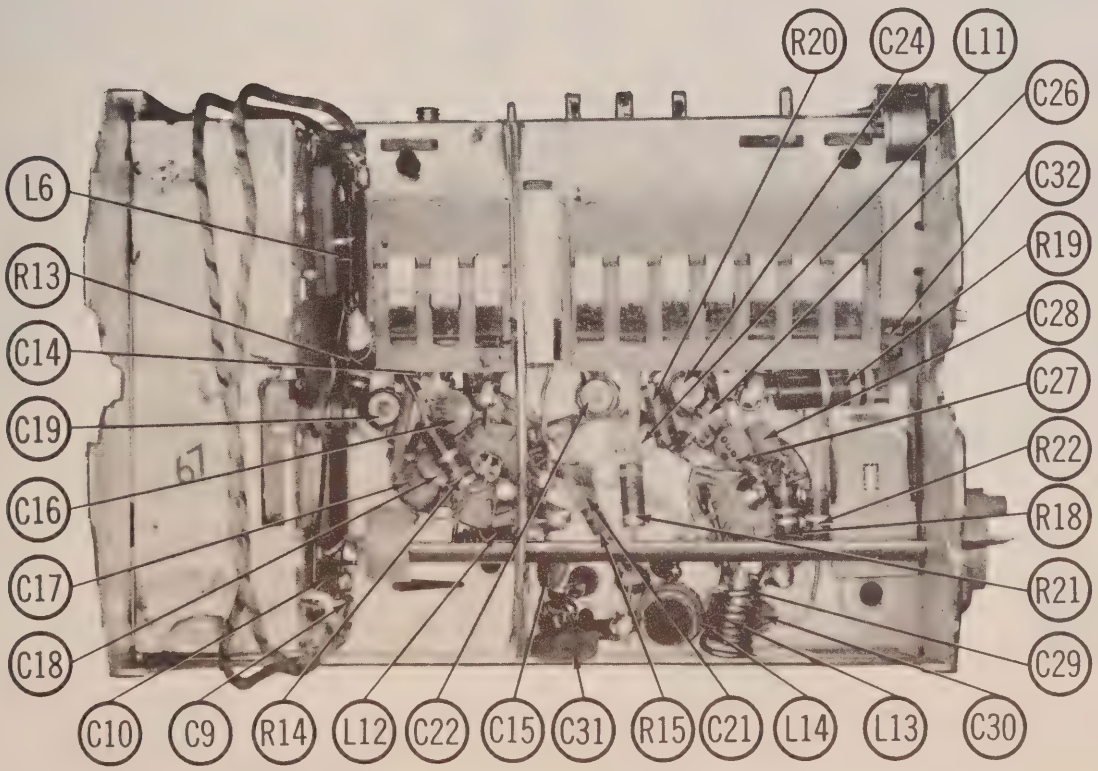
* Some versions may use crystal diode type CK706 in this application.

MISCELLANEOUS

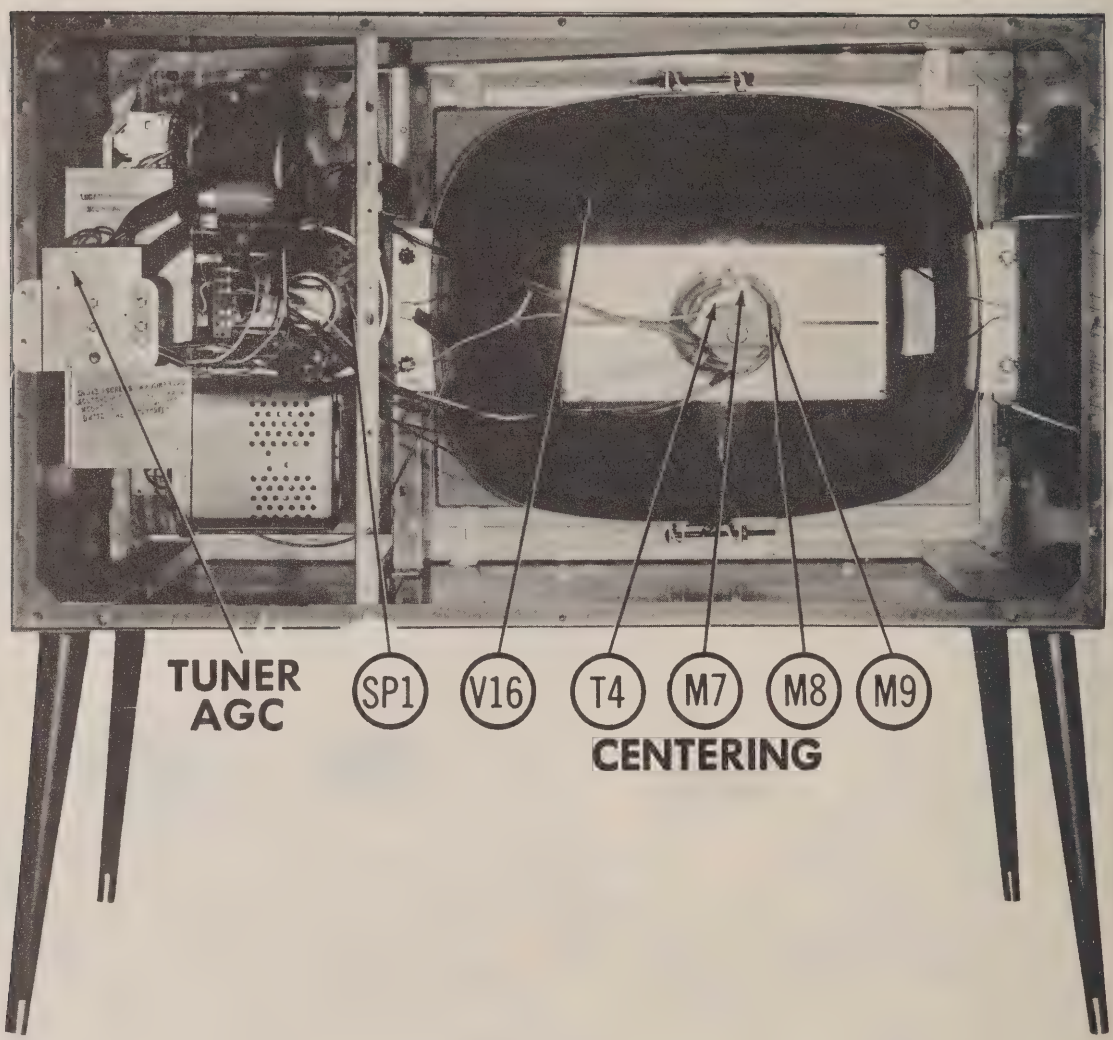
ITEM No.	PART NAME	TRUETONE PART No.	NOTES
M5	Tuner	211-25394	VHF-UHF combination
M6	Video Det. Assy.	13B-24206	Includes M4, coils and capacitors
M7	Centering Device	16M-24493	Includes deflection yoke (T4) rear cover
M8	Width Control	2C-25229	
M9	Ion Trap	16M-19705	
M10	Clock	201-26760	Complete assy.
	Clock Crystal	6A-26758	
	Knob	4B-26768	Time set
	Cabinet	200-26740	Model 2D-1715A
	Cabinet	200-26740-1	Model 2D-1716A
	Safety Glass	30M-25304	
	Mask	25M-25301-A200	
	Knob	5B-25412-A29	Fine tuning -Model 2D-1716A
	Knob	5B-25412-A76	Fine tuning - Model 2D-1715A
	Knob	5B-24138-A29	Picture, Model 2D-1716A
	Knob	5B-24138-A76	Picture, Model 2D-1715A
	Knob	5B-25413-A188	VHF Indicator
	Knob	5B-26798-A188	Volume, Model 2D-1715A
	Knob	5B-26799-A188	Volume, Model 2D-1716A
	Knob	5B-26903-A76	UHF Indicator, Model 2D-1715A
	Knob	5B-26903-A188	UHF Indicator, Model 2D-1716A
	Knob	5B-23839-A76	Control (3 used) Model 2D-1715A
	Knob	5B-23839-A29	Control (3 used) Model 2D-1716A



RF TUNER-TOP VIEW



RF TUNER-BOTTOM VIEW



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably with a test pattern.

Turn the horizontal hold control (R2) to its mid-range position.

Connect a short clip lead across L30. Adjust the horizontal frequency slug (B1) until the picture synchronizes horizontally. Remove clip lead from L30. Connect the vertical amplifier of the oscilloscope thru a low capacity probe to point Ⓒ. Low side to chassis.

Adjust the horizontal phase slug (B2) until a waveform similar to Fig. 8 is obtained. While making this adjustment, keep picture in sync with the horizontal hold and B1. Remove the scope connection. Turn R2 fully counter clockwise and then fully clockwise. The picture should fall out of sync at both extreme settings of R2.

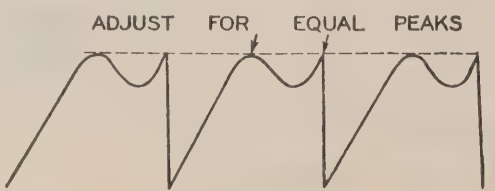


FIG. 8

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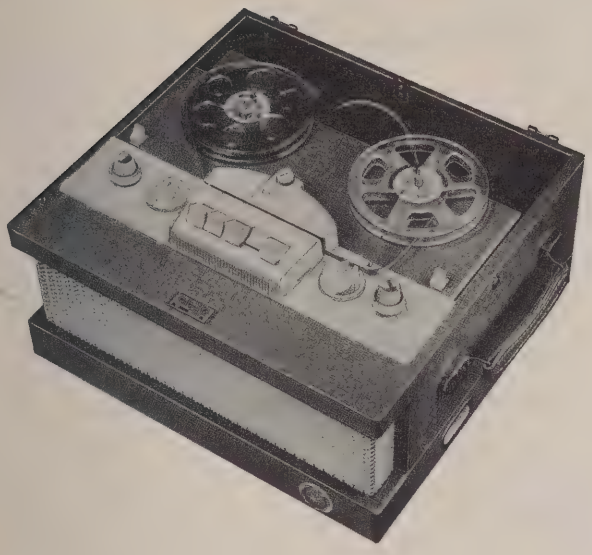
V-M
MODELS 710, 711, 750

V-M
MODELS 710, 711



V-M
MODEL 750

V-M
MODELS 710, 711, 750

GENERAL INFORMATION

The Models 710, 711, 750 are designed to operate on 60 cycle, 110-120 volts, AC supply only. Power consumption: 100 Watts.

CAUTION: Severe damage will result if connection is made to a direct current (DC).

MANUFACTURED BY:
V-M CORPORATION
BENTON HARBOR, MICHIGAN

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GENERAL INFORMATION

V-M Tape-O-Matic Models 710, 711, and 750 are similar in basic design and construction. All are twin-track, two-speed recorders, operating at either 3 3/4 or 7 1/2 inches per second.

Models 710 and 711 are housed in portable cases, while the 750 is a cabinet model. Models 711 and 750 feature a binaural playback head and a binaural pre-amplifier stage for playing "stereophonic" tapes. The 710 and 711 have a woofer and a tweeter speaker, while the 750 has two woofer speakers and one tweeter speaker.

SPECIFICATIONS

Voltage & Power Required -
105-120 volts, 60 cycle AC supply only. Power consumption: 100 watts.

Power Cord -
8 feet long.

Fused -
3 amps.

Playing Time -
2 channels at 3 3/4" per sec; 2 hrs. At 7 1/2" per sec; 1 hr. with 7" reels.

Microphone -
Extended fidelity 60 to 10,000 cycles ± 5 db. 8 foot cable with shielded phone plug.

Amplifier Tube Complement -
Model 710: (2) 12AX7, 6V6GT, 6SN7GT, 5Y3GT. Models 711 and 750; (3) 12AX7, 6V6GT, 6SN7GT, 5Y3GT.

Power Output -
5 watts at less than 3% distortion, 8-16 ohms. Damping factor 7-15.

Frequency Response -
Amplifier - 20 to 20,000 cps ± 1 db. Record-Playback-40 to 15,000 cps ± 5 db.

Tone Balance -
+ 15 db at 50 cps; + 8 db at 10 kc; -15 db at 10 kc.

Record Bias & Power Erase -
75 kc.

Wow & Flutter -
Less than .4% RMS.

Controls -
5 safety interlocked buttons for - Stop (and storage), Record, Play, Fast Forward and Fast Rewind. Tone Control; Volume Control; Instant Pause Control with stand-by lock; Monitor Switch; Precision Tape Index Counter; Automatic Shut-off; 60 cycle Hum Control (concealed); Noise Balance (concealed); Record Normal and Over-load Indicators with sensitivity adjustments (concealed).

Speakers -
Models 710 and 711: (1) 6X9" woofer with 2.5 oz. Alnico V magnet, (1) 3 1/2" tweeter with 1.5 oz. Alnico V magnet.

Model 750: (2) 8" woofers with 2.5 oz. Alnico V magnets, (1) 3 1/2" tweeter with 1.5 oz. Alnico V magnet.

Signal to Noise Ratio -
Better than -45 db.

Stere-O-Matic Output Jack (Models 711 and 750) -
For playing "stereophonic" tape through an external amplifier.

Output Jacks -
(1) for single or multiple speaker operation, 8-16 ohms. (1) external amp. output (may be used as input from low impedance source.

Input Jacks -
Microphone, Radio-Phono-TV; Magnetic Phono.

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FUNCTIONS OF CONTROLS, INDICATORS, SWITCHES, & RECEPTACLES

Push Buttons

Stop Button -

The "Stop" button should be depressed before each operation and when the machine is not in use.

Record Button -

Depress the "Record" button for recording a tape. The red "Safety" lever must be held to the right before the "Record" button can be depressed.

Play Button -

Depress the "Play" button for playing back a recording. Adjust, the "Volume" control to the desired level and adjust the "Tone" control for the most pleasing reproduction.

Rewind Button -

Depress the "Rewind" button for high speed rewind of the tape.

Forward Button -

Depress the "Forward" button for high speed forward. This button can be used to skip portions of tape in order to find a desired selection.

Record Level Indicators

Distort Indicator -

The "Distort" lamp indicates when tape is being overloaded (surplus volume) while recording. Adjust the "Volume" control so that faint flashes occur at loudest sounds (peak output).

Normal Indicator -

The "Normal" lamp indicates correct recording level. Adjust the "Volume" control until the "Normal" lamp flashes regularly.

Tape Index Timer

Set both the large and small dials of the timer to zero after threading a reel of tape. After each selection is recorded, note the timer readings for future reference. In this way, the timer can be used for locating a pre-recorded selection on the tape.

Speed Control Button

The arrow on the speed control button points to the speed (inches per second) at which the tape is passing by the heads. Should a change in speed be desired, simply turn the speed control button with a coin. Insofar as quality of recording-reproduction is concerned, speed is an all-important factor. The higher the speed, generally, the greater will be the fidelity.

Safety Lever

The safety lever locks the "Record" button to prevent accidental erasing. Push "S" lever to the right and hold while depressing the "Record" button.

Pause Button

To stop the travel of the tape, while recording or playing, push the "Pause" button. Should you desire to lock the "Pause" button in position, push it toward the rear of the unit and move it to the right. The "Pause" button feature allows for the adjustment of recording volume before the tape is set in motion and also for noiseless momentary stops, to eliminate commercials when recording from a radio or TV set, plus lulls in conversation, etc.

Monitor Switch

The "Monitor" switch is used should you desire to listen to a recording while it is being made. Also, the "Monitor" switch should be left in the "On" position should the unit be used as a phonograph amplifier or a public address system.

Automatic Shut-Off Switch

The mechanism is automatically shut off unless tape is threaded in front of the plastic shut-off lever. Should tape break, or the supply reel become empty, the mechanism and amplifier will shut off automatically and will remain so until the machine is re-threaded.

Input Receptacles

Microphone Input Receptacle -

Any high impedance crystal, ceramic, or dynamic microphone may be plugged into this receptacle for recording or for using recorder as a public address system. A 250 ohm microphone can be used without a transformer.

Radio-Phone Input Receptacle -

To record or play from a phonograph, use the special adaptor supplied with each recorder. Insert a standard phono plug into the adaptor and plug the adaptor part-way into the receptacle.

To record directly from a radio or TV set, use the 8 foot patch cord supplied with each recorder. Connect the alligator clips to the voice coil terminals of the radio or TV set. Insert the standard phono plug into the phono-adaptor plug and insert the adaptor part-way into the "Radio-Phono" recptacle.

Magnetic Phono Input Receptacle -

This high-gain input has a built-in pre-amplifier providing special equalization for recording from phonographs equipped with magnetic cartridges such as the G-E or Pickering. This receptacle is automatically disconnected when the "Microphone-Radio-Phono" jack is in use.

Output Receptacles

External Speaker Output Receptacle -

This is a two-way jack; To use both an external speaker and the recorder's own speakers, insert the external speaker's plug part-way into this receptacle. To disconnect the self-contained speakers, insert the speaker plug all the way into this receptacle.

External Amplifier Output Receptacle -

This high impedance output supplies 1/2 volt for connecting to the phono input of an external amplifier.

Stere-O-Matic Output Receptacle- (Models 711 and 750) -

Plug the shielded cable supplied with Models 711, and 750 into this receptacle and into the input of your home music system. The volume control of the home music system will control the loudness of the signal which is picked up by the binaural head, while the volume control on the recorder controls the signal that is picked up by the play-record head.

STEREOPHONIC SOUND

Stereophonic tapes have two separate sound tracks, recorded simultaneously with two microphones. The sounds picked up by the left microphone are recorded on one track of the tape, and the sounds picked up by the right microphone are recorded on the second track of the tape. Thus, the microphones pick up the sound in the same manner that the ears would if they were in the same position. When a stereophonic tape is played, the listener will hear, through one speaker system, what the left microphone has picked up, and through the second speaker system, what the right microphone has picked up. In this manner, the listener receives a distinct impression of a third sound dimension.

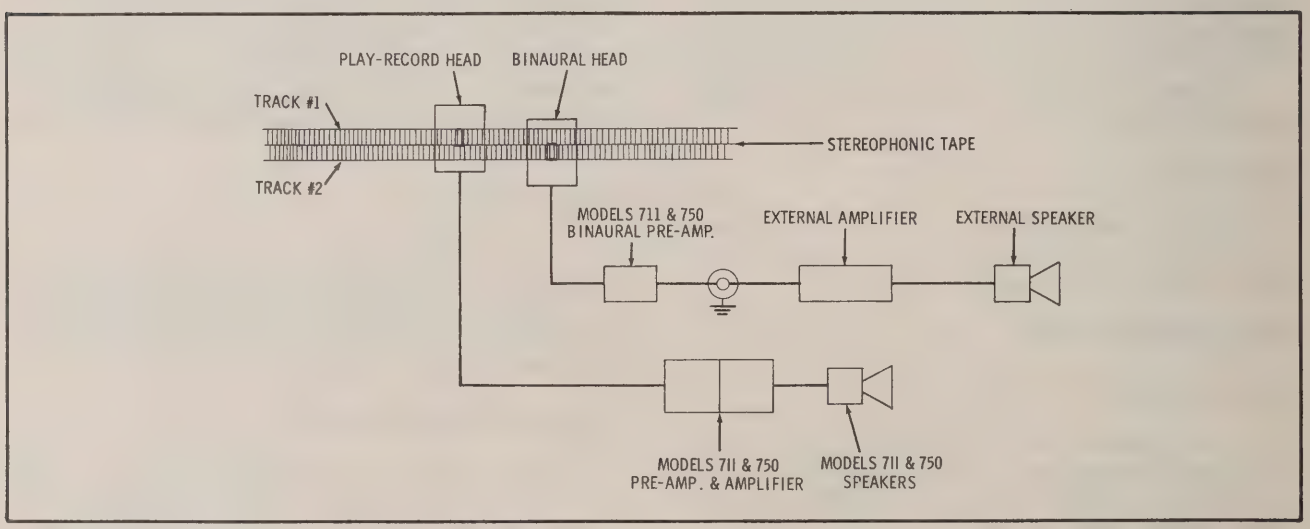

Figure 1. Models 711 & 750 Two-Channel Stereophonic System.

OPERATING INSTRUCTIONS

Threading The Tape -

With "Stop" button depressed, place empty reel on right hand (take-up) spindle. Place a full reel of tape on left hand (supply) spindle, so that it unwinds counter-clockwise. Thread tape, (glossy side out) following threading line (embossed in plastic escutcheon), straight through the slot in the covers and in front of the plastic "Automatic Shut-off Lever." See **Figure 2.** Place tape in front of chrome plated tape guide and insert free end of tape into hub slot of right-hand reel. Wind right-hand reel one or two turns counter-clockwise to take up slack between reels.

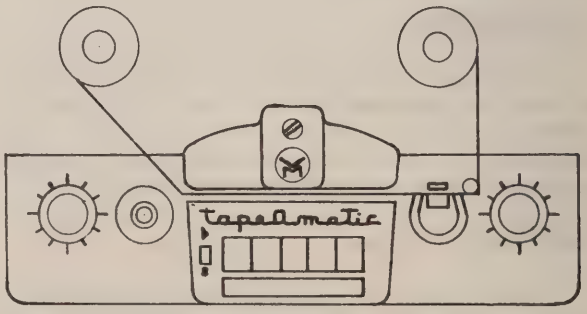

Figure 2

How to Record -

1. Insert the line cord into a 105-120 volt, 60 cycle, AC outlet and connect microphone or any other type of input.

2. Switch the recorder on by turning the "Bass-Treble" control clockwise.

3. Push the "Pause" button toward rear of unit and lock to the right.

4. Hold the red "Safety" button (marked S) to the right and depress the "Record" button.

5. Adjust "Volume" control so that faint flashes register on the "Distort" light at loudest sounds (peak output) and "Normal" light flashes regularly.

6. Set "Tape Index-Timer" dials to zero, noting on tape carton the reading at the beginning and end of recording.

7. Push "Pause" button to left to begin recording.

NOTE: These recorders have automatic built-in erase which operates only when in "Record" position and assures a clean tape for new recordings.

8. Depress the "Stop" button when recording is finished. To rewind tape depress the "Rewind" button. The recorder will shut off automatically when rewinding is completed.

How-To Play Recordings -

1. Thread tape as outlined under "Threading the Tape".

2. Depress the "Play" button and adjust the "Volume" control and "Tone" control for desired tonal quality.

3. Depress the "Stop" button when finished.

How To Play Stereophonic Tapes - Models 711 & 750 -

1. Thread "Stereophonic" tape as described under "Threading The Tape".

2. Plug the shielded cable supplied with Models 711 & 750 into the "Stere-O-Matic" output receptacle and into the input jack of the home music system.

3. No hard and fast rule can be set for the placing of the units since much depends on the room. Generally, the units are best placed not closer than 5 feet nor more than 10 feet apart. They should be placed where they sound best to you; your own ear is the best judge.

4. After switching both units on, depress the "Play" button.

5. The volume control of the home music systems will control the loudness of the signal which is picked up by the binaural head, while the volume control on the recorder controls the signal that is picked up by the play-record head. In volume level adjusting, try to keep the level balance such that sounds seem to come from between the speakers.

Dual Track Recording -

These Tape-O-Matic recorders are designed so that only one-half the tape width is recorded at one time. This permits dual track recordings to be made in the following manner:

1. After a reel of tape has been recorded, a second track may be recorded on the same reel (without rewinding) by removing the full reel from the right hand spindle, turning it over, then placing it on the left hand spindle. Place the empty reel on the right hand spindle.

2. Properly thread the tape and proceed with the recording as previously described.

3. After the second track has been recorded, the first track is ready to be played, without rewinding, by changing the reels as described in Step #1 above.

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MECHANICAL ADJUSTMENTS

Head-Bar Bracket Adjustment -

Adjust head bar bracket (33) so that head bar (36) moves freely without binding. If bracket is too loose, pressure roller (53) will not press against capstan evenly causing flutter or the tape to climb.

Pressure Roller Alignment -

The pressure roller stud must be parallel with the capstan or tape will creep up or down on the capstan. As a check, remove "C" washer (51) and raise pressure roller (53) slightly and depress the "Play" button. If pressure roller raises or lowers, straighten stud by using tool #2-B-132 or by slipping a close fitting sleeve over the stud.

Pressure Roller Pressure Adjustment -

The pressure roller pressure should be from 2 1/2 to 3 1/2 pounds against the capstan in "Record" and "Play" position. To adjust pressure, bend button levers (88) where head bar activating springs (71 and 73) are hooked. To decrease pressure, bend tab in; to increase pressure, bend tab out.

Stop Adjustment -

Bend stop button lever (88), where brake activating hook (72) connects, so that brakes release reel disks when another button is depressed. When "Stop" button is depressed, bell crank (127) must disengage capstan idler (120) from the motor shaft and from the flywheel and capstan assembly (143).

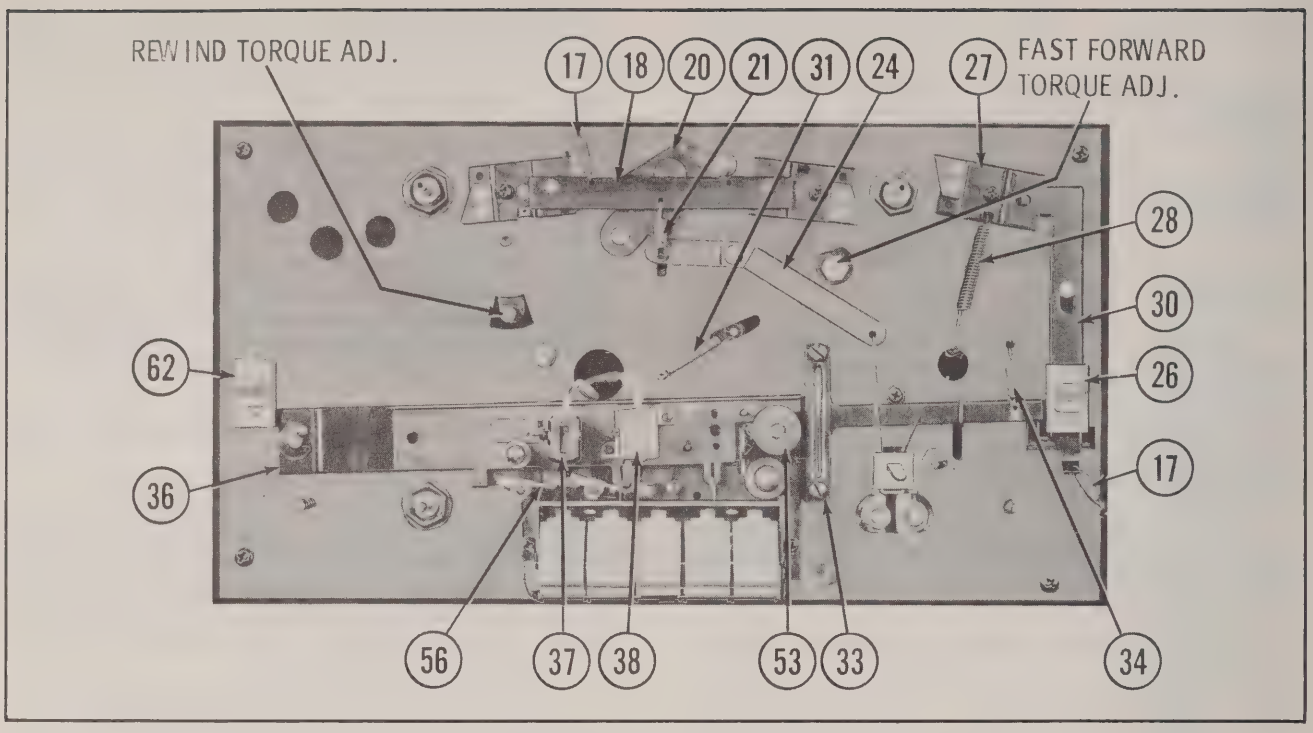


Figure 3. Top View Of Model 710 Tape Transport Mechanism.

Play and Record Torque Adjustment -

The takeup torque in "Play" and "Record" should be 1 1/2 to 3 ounces measured 2 3/4 inches from the center of the take-up reel. Using a pair of needle nosed pliers, bend take-up actuator (112) at point "A" on exploded view, shortening or lengthening to increase or decrease torque.

Fast Forward Torque Adjustment -

The fast forward torque must be 5 to 7 ounces measured 2 3/4 inches from the center of the take-up reel. To adjust, insert a 3/8" Spintite through the hole provided in the baseplate (see **Figure 3**). Turn the eccentric mounted tension pulley (123) counter-clockwise to increase torque or clockwise to decrease

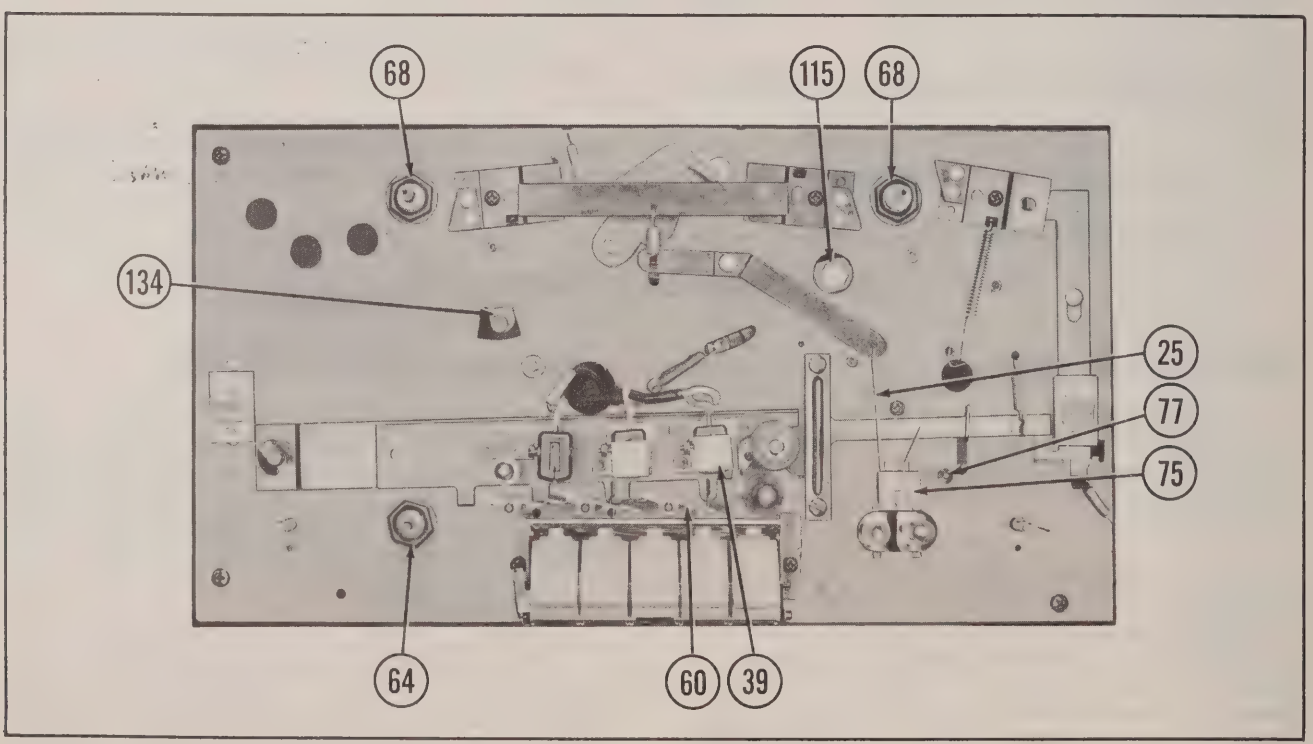


Figure 4. Top View Of Models 711 & 750 Tape Transport Mechanism.

torque, making sure not to exceed maximum travel of the eccentric.

Rewind Torque Adjustment -

The rewind torque should be 2 1/2 to 4 1/2 ounces measured 2 3/4 inches from the center of the rewind reel. If torque is low, make sure rewind driver (139) is not skidding on take-up driver (137). Clean drivers and rewind belt (140) of any oil or grease. If cleaning does not correct the low torque, adjustment can be made by turning the eccentric mounted stud on the rewind arm (see **Figure 3**).

Pause Brake Adjustment -

With tape on machine and "Play" button depressed, bend tab (point "B" on exploded view) on pause brake lever (30) so that right hand reel stops and tape drive releases simultaneously.

Play-Record Head Alignment Adjustment -
Models 710, 711 and 750 (Refer to **Figure 5**) -

It is very important that the play-record head (38) be lined up perfectly with the tape. If it is not, low output, loss of high frequencies, or track overlap may result. Adjust play-record head (38) as follows:

1. Head Height: The top of the play-record head pole pieces must be set even with the top edge of the tape. To make this adjustment, thread tape on the recorder and loosen the two hex. nuts (42) on the side of the play-record head. After the head height has been adjusted, tighten the two hex. nuts (42).

2. Azimuth Alignment: To make this adjustment, obtain a standard alignment tape on which a recorded signal of 5000 cycles per second is available.

Connect an output meter or a sensitive A.C. voltmeter across the speaker voice coil terminals. While playing back the 5000 cycle signal, pivot play-record head (42), by turning hex. nut (45), until maximum amplitude on meter is achieved.

Erase Head Adjustment -
Models 710, 711, and 750 (Refer to **Figure 5**) -

The erase head (37) should be adjusted so that the pole pieces are approximately .005" above the top edge of the tape. Although not too critical, the erase head should be as near perpendicular to the tape as possible

Binaural Head Alignment Adjustment -
Models 711, and 750 (Refer to **Figure 5**) -

1. Head Height: The bottom of the binaural head pole pieces must be set even with the bottom edge of the tape. To check this adjustment, remove the binaural pressure pad arm assembly and thread tape on the recorder. Depress the "Play" button and with the aid of a small mirror observe the position of the pole pieces. If adjustment is required, loosen the two hex. nuts (43) on the side of the binaural head (39). After adjustment is made, tighten the hex. nuts.

2. Azimuth Alignment: To make this adjustment, obtain a standard full-track alignment tape on which a recorded signal of 5000 cycles per second is available.

Connect an output meter or a sensitive A.C. voltmeter across the binaural output jack. While playing back the 5000 cycle signal pivot the binaural head (39), by turning hex. nut (46), until maximum amplitude on meter is achieved.

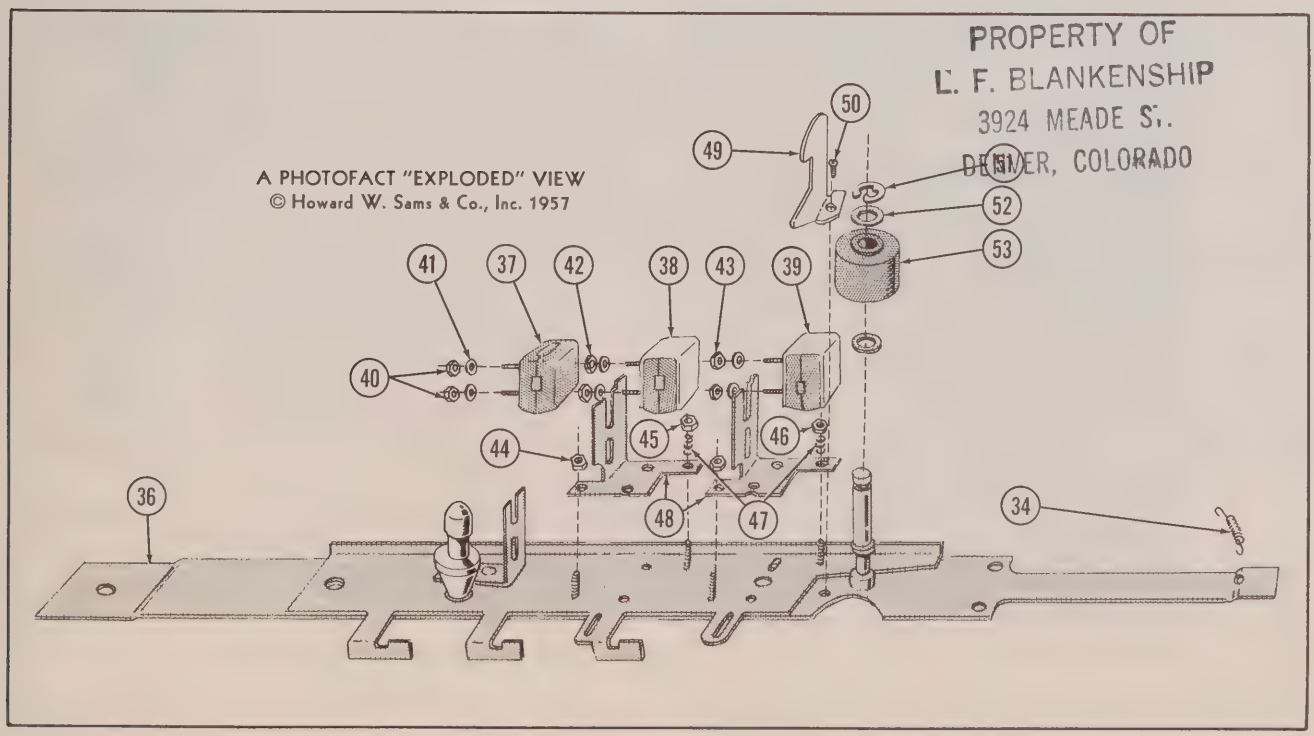


Figure 5. Exploded View Of Head Bar Assembly.

ELECTRICAL ADJUSTMENTS

Hum Balance Adjustment -

The hum balance control (R4) is located toward the right rear corner of the amplifier chassis. On models 710, and 711, this control is accessable through the storage compartment. On Model 750, the control can be adjusted by removing the grille from rear of cabinet.

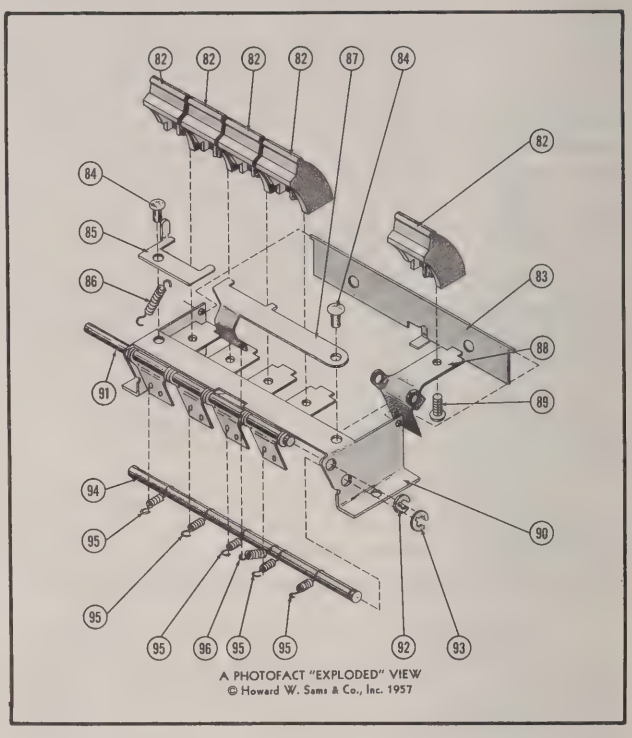
To adjust, place "Volume" and "Tone" controls at maximum and set hum balance control (R4) for minimum hum. Try line cord plug both ways.

Normal and Distort Indicator Adjustments -

Adjust the normal (R3A) and distort (R3B) controls on the Models 710, 711, and 750 as follows:

Using an audio generator, apply a 1/2 volt, 1000 cycle signal to the external output jack of the recorder. Connect an A.C. voltmeter to the external speaker jack (inserting the plug all the way so no load is applied to the secondary of the output transformer). With the "Stop" button depressed, set the "Tone" control to the approximate center and adjust the output of the recorder to .7 volts with the "Volume" control.

Next, depress the "Record" button and adjust the distort control (rear or bottom section of the control) until the "Distort" light flickers. After adjusting the "Distort" indicator, return the unit to the stop position and reset the "Volume" control for an output of .3 volts. Again, put the recorder in the "Record" position and adjust the "Normal" control (upper or panel section of the control) until the "Normal" light flickers.



Exploded View Of Control Button Assembly.

LUBRICATION

Lubricants applied at time of manufacture are sufficient to last for a long period of time, but in case parts are replaced, or approximately once a year, lubricate as follows:

Apply S. A. E. #5 Motor Oil to:

1. Both capstan bearings. To oil capstan bearings, place one small drop of oil on each bearing. CAUTION: Be sure no oil is on the portion of capstan extending above baseplate.
2. Tension pulley (123) bearings.
3. Reel disc bearings (101).
4. Rewind driver (139) bearing.
5. Capstan idler (120) bearing.
6. Take-up driver (137) bearing.
7. Pressure roller (53) bearing.

NOTE: When oiling any bearing in which a rubber part is mounted, or part using a belt, apply only one small drop of oil.

NOTE: Oil and grease must be kept off all rubber idlers, belts and periphery of flywheel and off parts that might transfer oil or grease to them.

Apply Trojan "H2" Grease to:

1. Between brake arm (18) and brake shoes.
2. Between brake shoes and baseplate.
3. Between rewind arm (134) and baseplate.
4. Under head bar (36) pivot bosses.
5. Top of head bar (36) above R. H. bosses.
6. Between take-up bar (115) and baseplate.
7. Between pause brake lever (30) and baseplate.
8. Between bell crank (127) and baseplate.
9. Latch bar (83) on cam side where button levers (88) make contact.
10. Latch bar (83) and button housing (90) pivot holes.
11. Brake rod (128) ends at baseplate holes.
12. Rewind rod (133) at baseplate hole.
13. Fast forward rod (110) at take-up bar (115) slot.
14. Holes in baseplate where amplifier switch extensions slide.

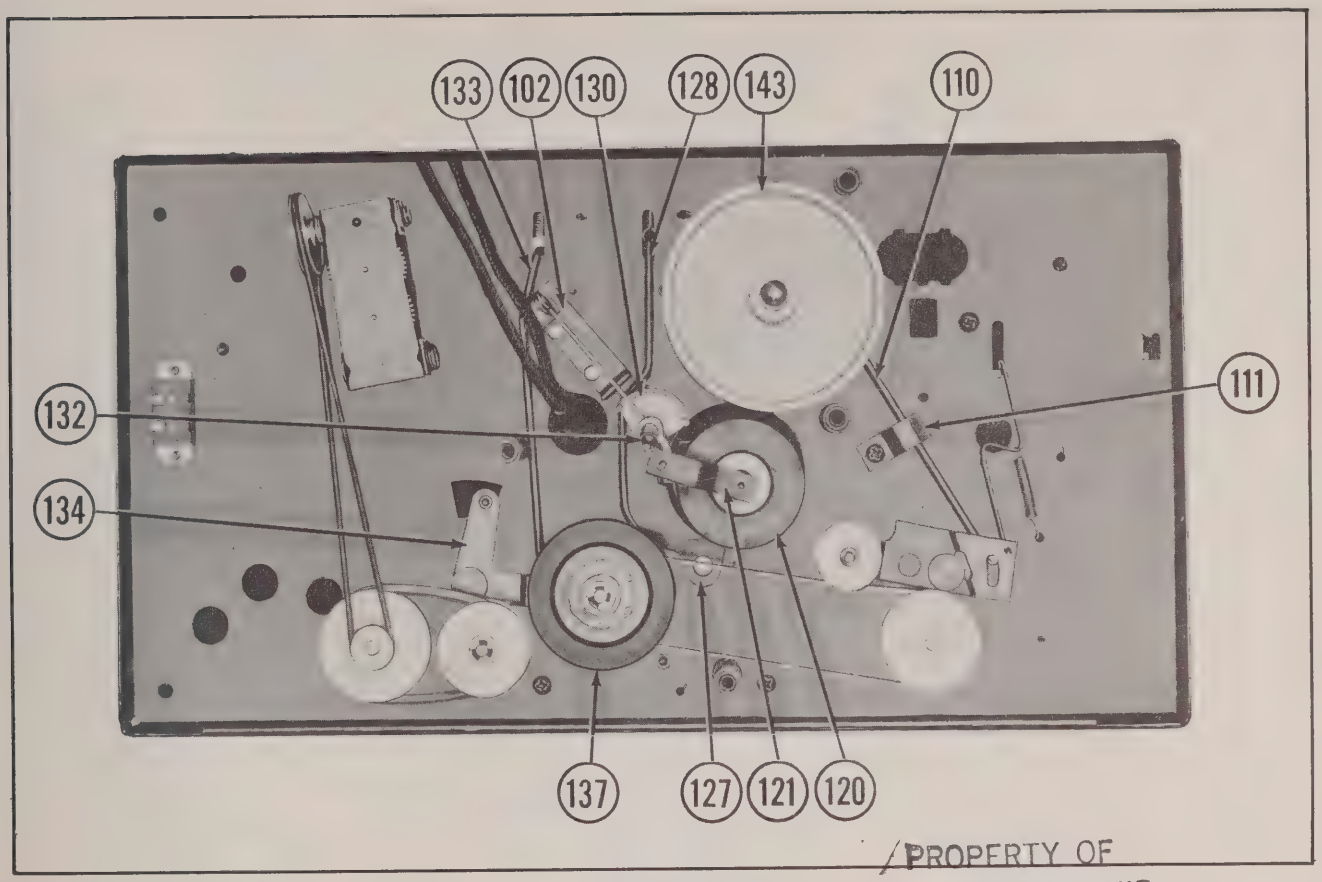


Figure 6

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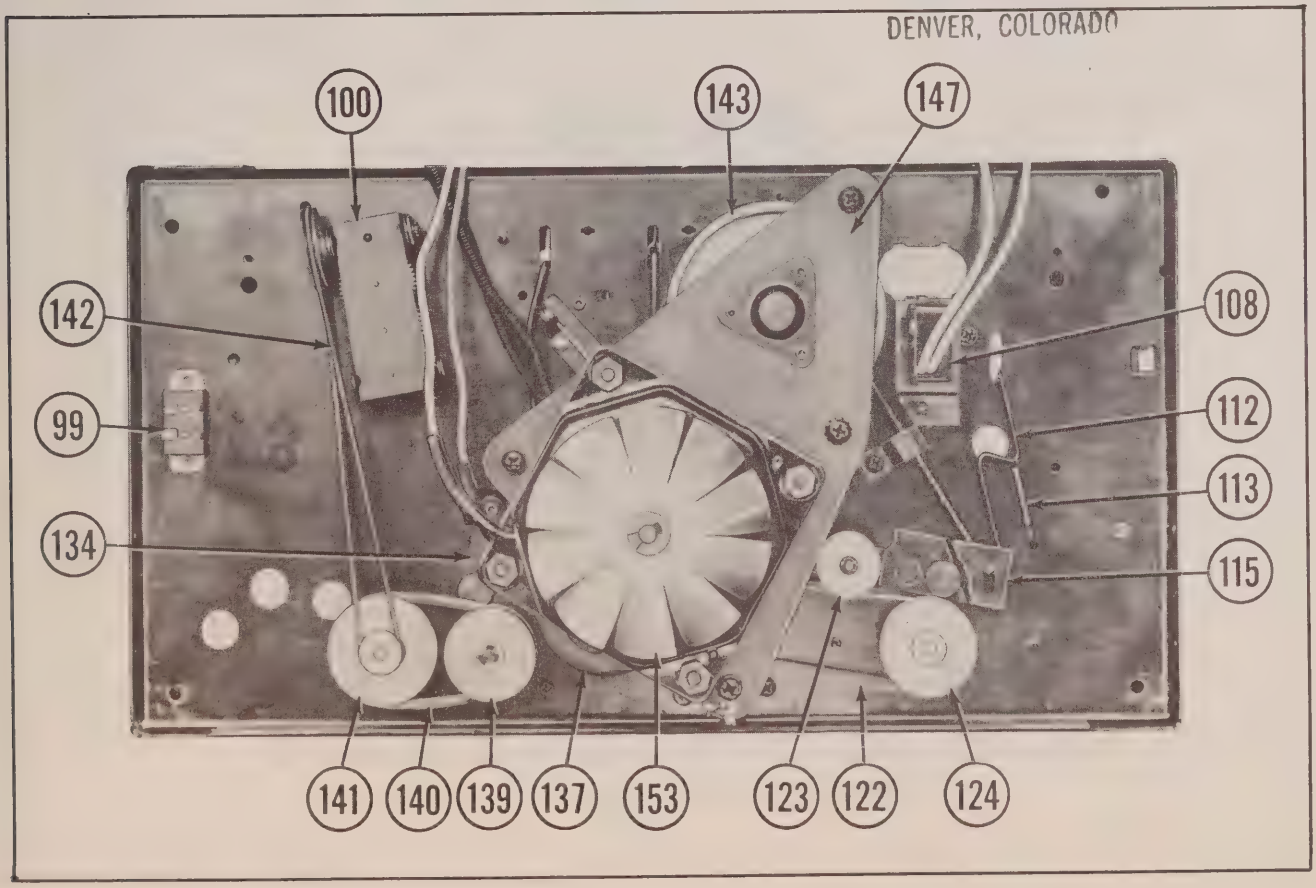

Figure 7

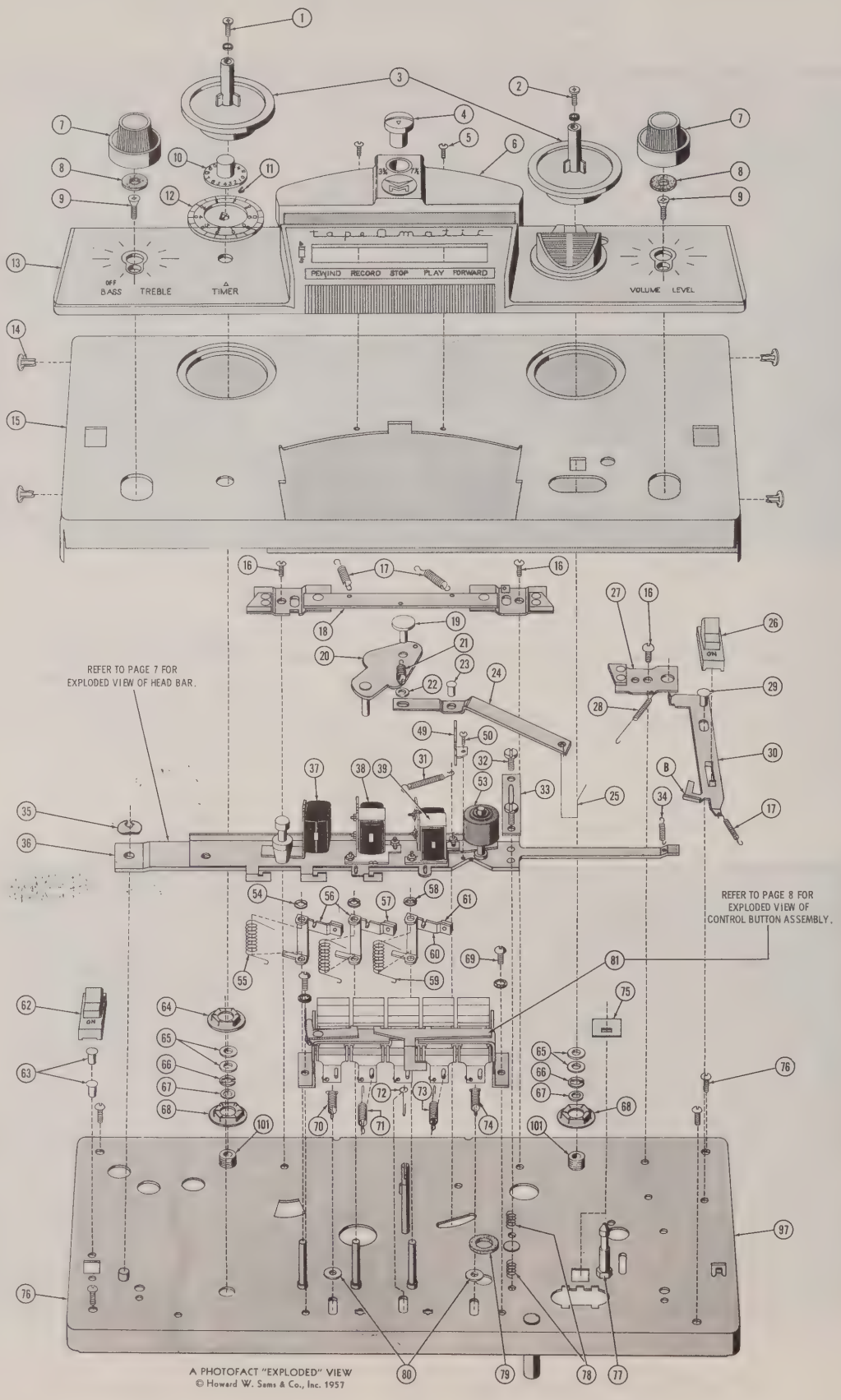
tape-matic
REWIND RECORD STOP PLAY FORWARD
OFF BASS TREBLE
TIMER
VOLUME LEVEL
REFER TO PAGE 7 FOR EXPLODED VIEW OF HEAD BAR.
REFER TO PAGE 8 FOR EXPLODED VIEW OF CONTROL BUTTON ASSEMBLY.
A PHOTOFACT "EXPLODED" VIEW
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Figure 8A. Exploded View Of Parts Above Baseplate.

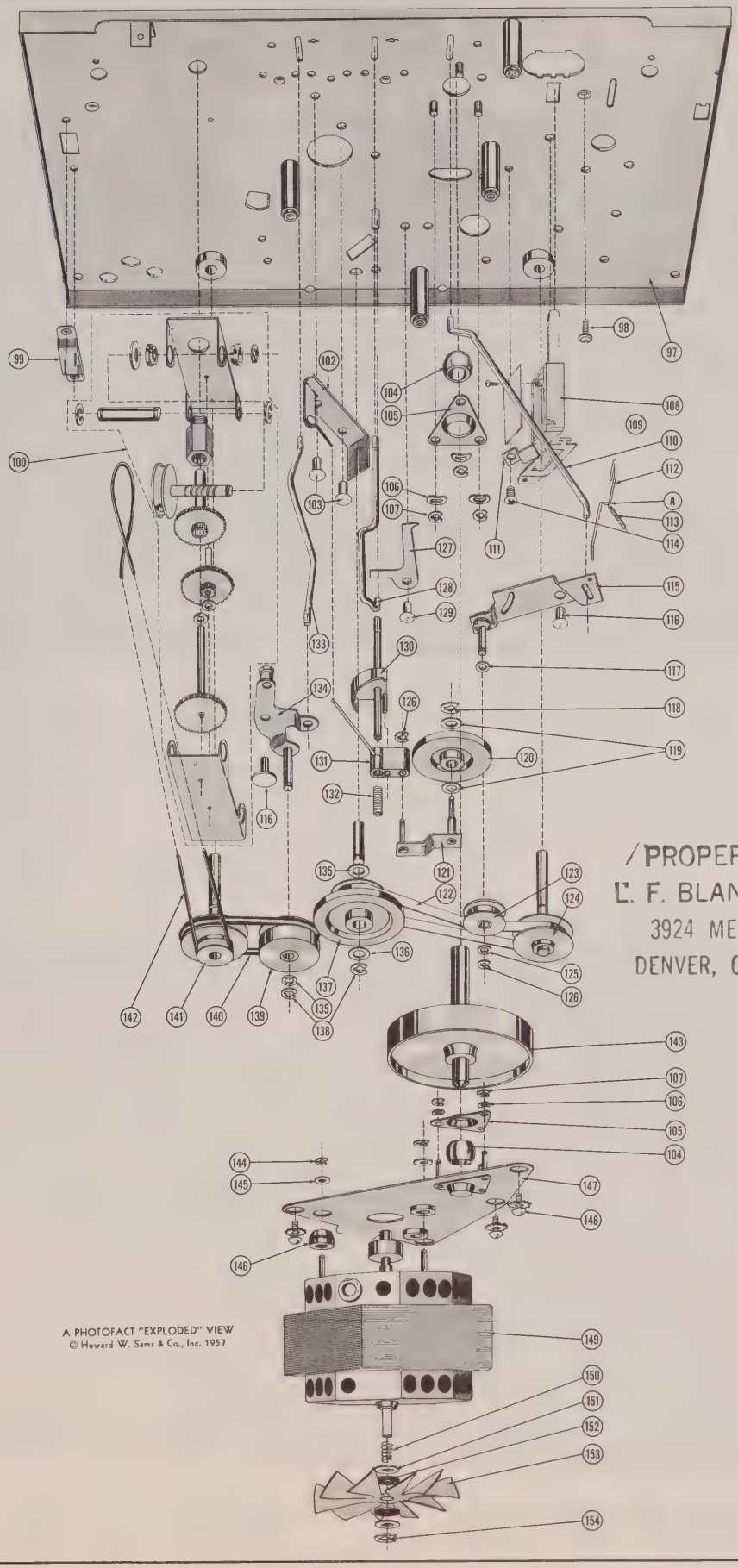


Figure 8B. Exploded View Of Parts Below Baseplate.

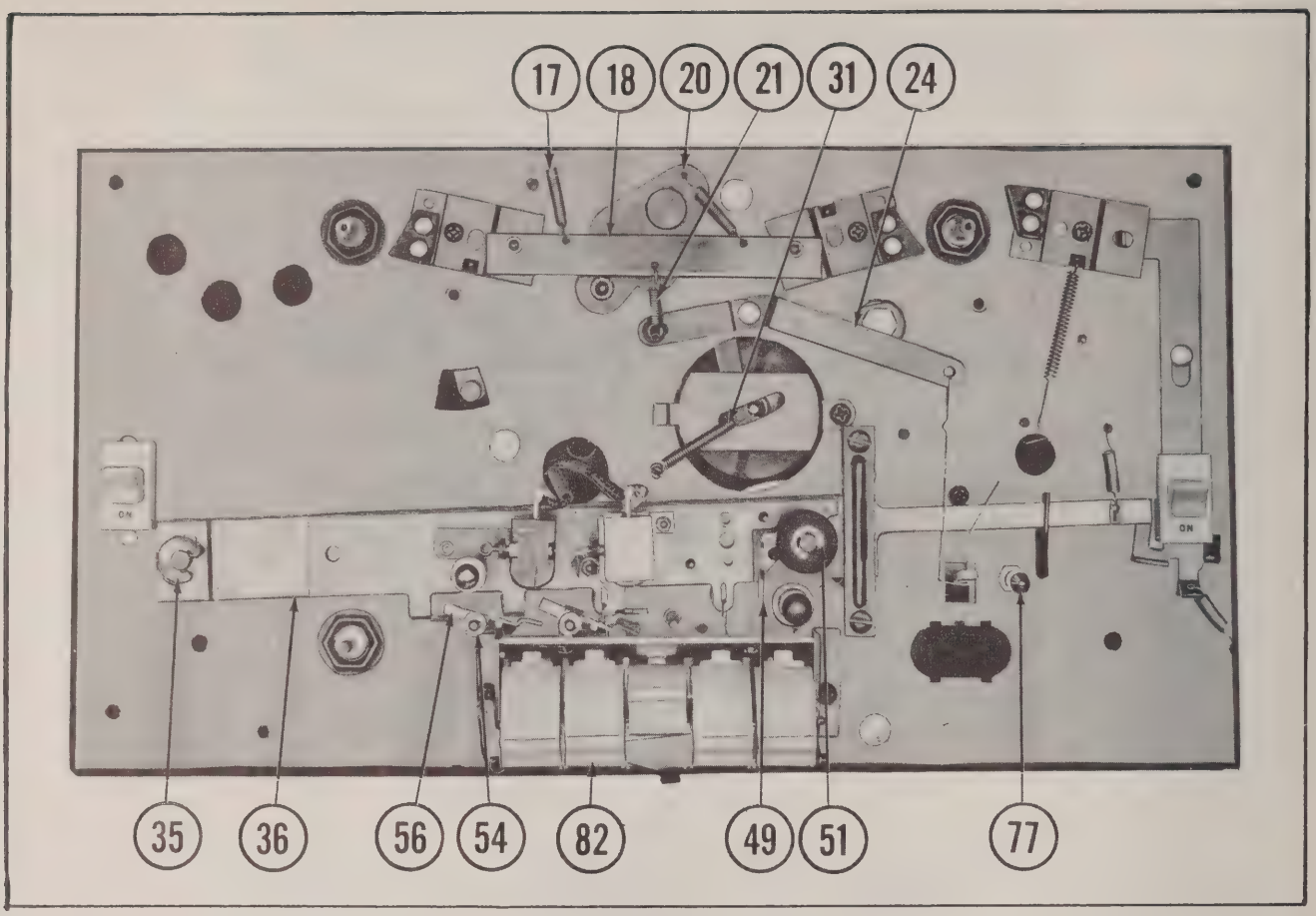


FIGURE 9

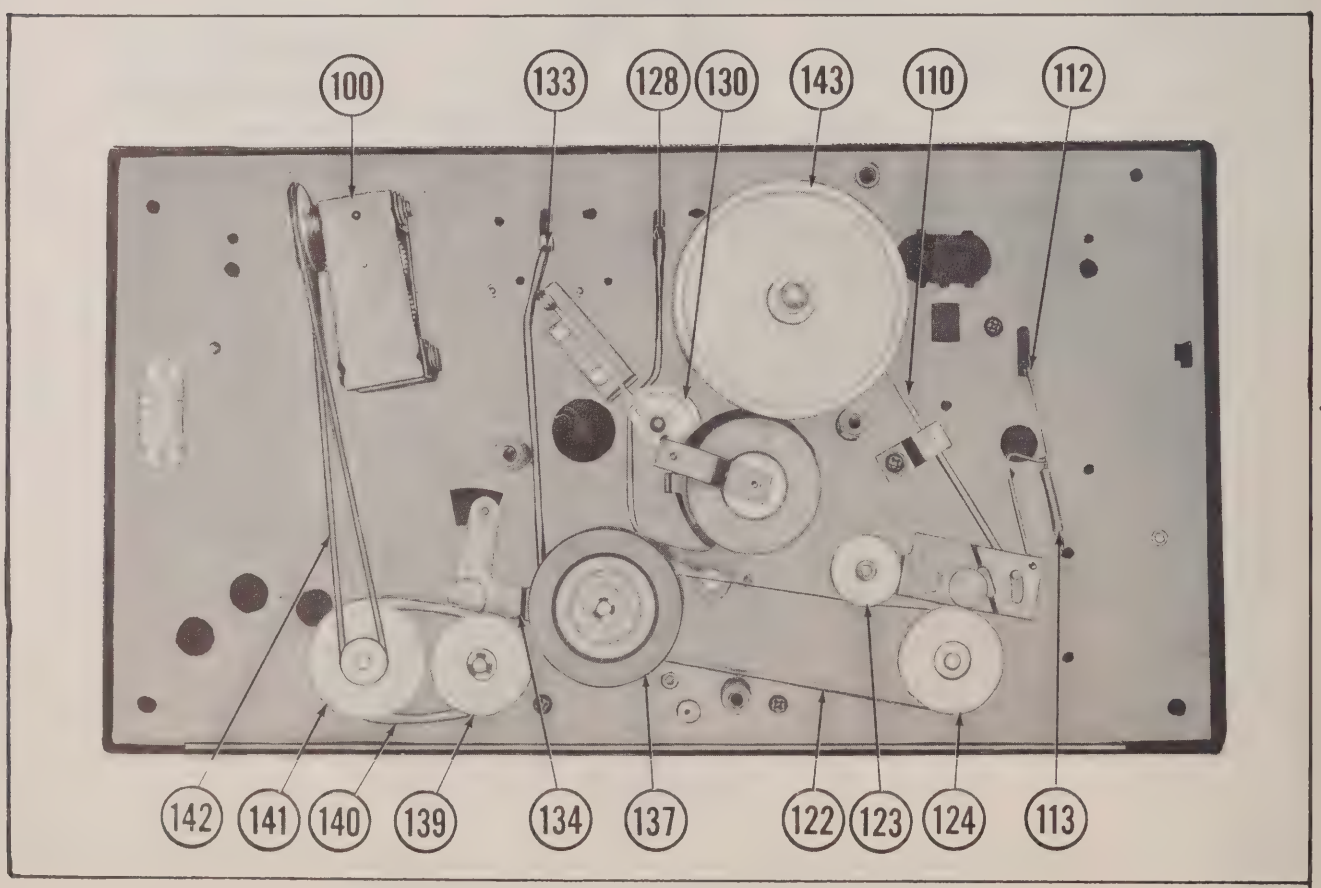


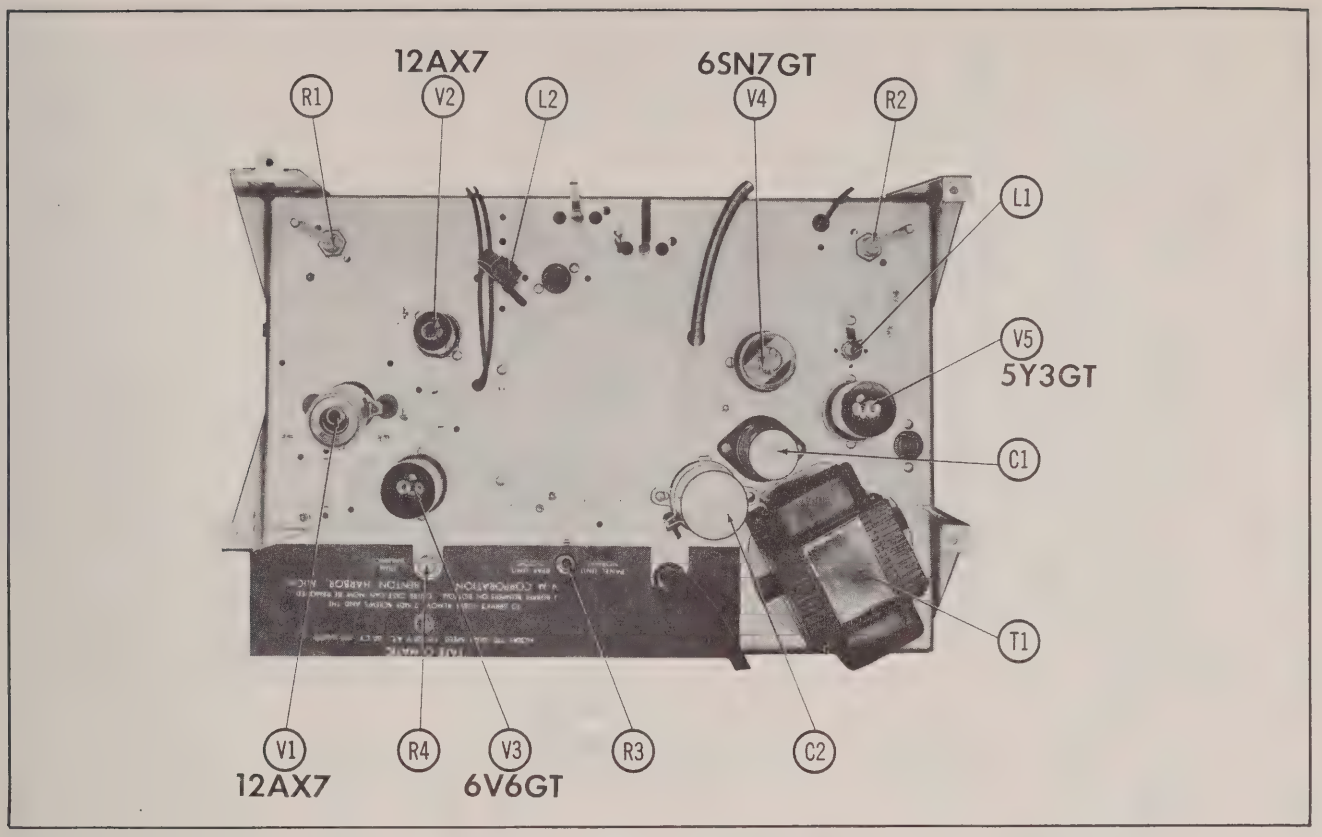
FIGURE 10

SYMPTOM	CAUSE	REMEDY
Take-up Reel does not revolve in play or record position.	1. Pause Brake on, or sticking.	1. Release pause brake; check that pause brake lever (30) is free and releases completely.
	2. Brakes (18) not releasing properly.	2. Check that brakes (18) are releasing completely, if not, adjust button lever (88) on stop button.
	3. Take-up belt (122) worn.	3. Replace worn or stretched belt.
	4. Take-up belt (122) off pulleys.	4. Pulleys must be aligned correctly or belt will continue to slip off.
	5. Capstan idler (120) not engaging flywheel.	5. Check that speed change button is in detent completely; also check that bell crank (127) is releasing the capstan idler (120).
	6. Speed change not in detent completely.	6. Turn button to proper speed.
	7. Tension pulley (123) not engaging take-up belt.	7. Check that take up arm (115) is not binding on baseplate, or take up rod (110).
	8. Pressure roller (53) applying too much pressure against capstan, stalling motor.	8. Adjust button lever (88) on play and/or record buttons so the pressure roller applies from 2 1/2 to 3 1/2 lbs. pressure on the capstan. (See "Mechanical Adjustments").
	9. Tension pulley (123) not adjusted properly.	9. Tension pulley must be adjusted properly. (See "Mechanical Adjustments").
	10. Head bar activating springs (71 or 73) off or broken.	10. Replace.
	11. Take-up bar actuator not adjusted properly.	11. See "Mechanical Adjustments".
	12. Take-up driver (137) not engaging motor shaft.	12. Take-up arm (20) must operate freely.
Take-up Reel does not revolve in Forward Position.	1. Button lever (88) not adjusted properly.	1. Button lever can be adjusted to make small deviations in torque (See No. 5).
	2. Activating Spring (21) loose or broken.	2. Replace.
	3. Take-up belt (122) off pulleys.	3. Replace (See "Take-up Reel does not revolve in Play or Record position").
	4. Take-up belt (122) worn.	4. Replace.
	5. Tension pulley (123) not adjusted properly.	5. In forward position, tension pulley should be adjusted so there is 5 to 7 ozs. of torque approximately 2 3/4 in. from the center of the reel. See "Mechanical Adjustments".
	6. Brake sticking on supply reel disc.	6. Check that brake return springs are releasing brakes.
	7. Too much friction in counter (100).	7. Counter should turn freely without binding.

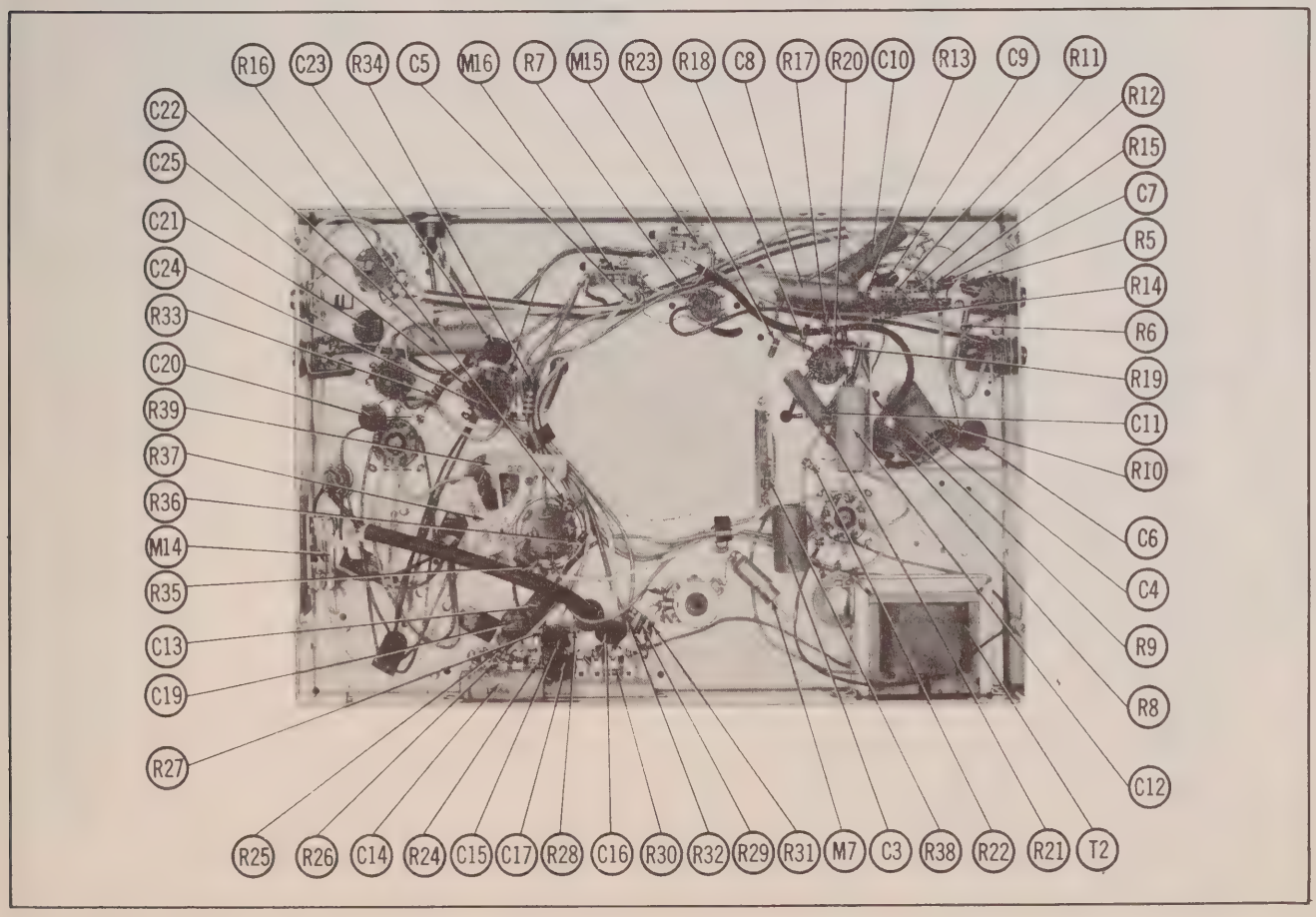
SYMPTOM	CAUSE	REMEDY
	8. Motor stalling.	8. Check that tension pulley (123) is adjusted properly. (See No. 5).
	9. Tension pulley (123) not engaging take-up belt.	9. Check that take up arm (115) is not binding on base-plate or take-up rod (110).
Reels do not stop when stop button is depressed.	1. Button lever (88) not adjusted properly.	1. Button lever must be adjusted to release the brakes completely when another button is pushed.
	2. Brake activating hook (72) or spring (21) loose or broken.	2. Replace.
	3. Brake Assembly binding.	3. Check to see if brake assembly operates freely.
	4. Tension pulley not adjusted properly.	4. (See "Take up Reel does not revolve in Forward Position").
	5. Brakes worn.	5. Replace brake assembly (18).
	6. Take up arm (115) sticking.	6. Take up arm must operate freely.
Weak Output (Mech.)	1. Playback Head (38) not aligned properly.	1. Head should be aligned for maximum output. See "Mechanical Adjustments".
	2. Pressure Pad (57) not making proper contact with head.	2. Pressure Pad (57) should make complete contact with head pole piece.
	3. Light pressure pad pressure.	3. Pressure pad must have from 12 to 18 grams pressure on head.
	4. Defective Record Head (38).	4. Replace.
Take-up Reel revolves fast when Play or Record buttons are depressed.	1. Tab on pause brake lever (30) not adjusted properly.	1. Adjust pause brake lever so pressure roller (44) disengages capstan, and take up reel stops simultaneously.
	2. Head bar bracket (33) too tight.	2. See "Mechanical Adjustments".
	3. Button levers not adjusted properly.	3. Button levers (88) must be adjusted so pressure roller (53) applies from 2 1/2 to 3 1/2 lbs. pressure on capstan in play or record position. See "Mechanical Adjustments".
	4. Pressure roller (53) not aligned properly.	4. See "Mechanical Adjustments".
Supply Reel does not revolve in rewind position.	1. Loose reel shaft screw (1).	1. Tighten.
	2. "O" Ring (140) off drive pulleys.	2. Replace.
	3. Rewind torque not sufficient.	3. See "Mechanical Adjustments".
	4. Activating spring (21) loose.	4. Replace.

SYMPTOM	CAUSE	REMEDY
	5. Take-up driver (137) not engaging motor drive shaft.	5. See ("Take-up Reel does not revolve in Play or Record Position").
	6. Brake sticking on take-up pulley.	6. Check that brake arm assembly is free and not binding, also check that brake return springs are releasing brakes.
	7. Pause Brake on.	7. Release.
	8. Oil on "O" Ring (117).	8. Remove all oil from "O" Ring and pulleys.
Does not shut off at the end of tape.	1. Defective switch.	1. Replace or repair.
	2. Switch wand catching on plastic escutcheon (13).	2. Position switch by loosening self-tapping screw (98).
Wow or Flutter (Record or Play Back).	1. Bump on take-up belt (122).	1. Replace.
	2. Safety Switch (108) applying too much pressure on tape.	2. Replace
	3. Brakes dragging.	3. (A) Adjust stop button lever (88) so brakes release completely. (B) Check that brake return springs (17) not loose or broken. (C) Brake arm assembly must be free and not binding. (D) Pause brake must release completely.
	4. Flat or bumpy pressure roller.	4. Replace.
	5. Capstan bearings not aligned properly.	5. Tap capstan slightly (bearings are self-aligning).
	6. Eccentric Flywheel	6. Replace.
	7. Bumpy or eccentric capstan idler (120).	7. Replace.
	8. Head bar bracket loose.	8. (See "Take-up reel revolves fast in Play or Record position").
	9. Pressure roller (53) not aligned properly.	9. See "Mechanical Adjustments".
Unit does not turn on with Off-On Switch.	1. No current at motor or amplifier.	1. (A) Check that current is reaching AC leads. (B) Check that fuse is not burned out. If so, replace. (C) Check that Off-On switch and automatic shut-off switch are closing.
Button Interlock (87) inoperative.	1. Interlock bar return spring loose or broken.	5. Replace.

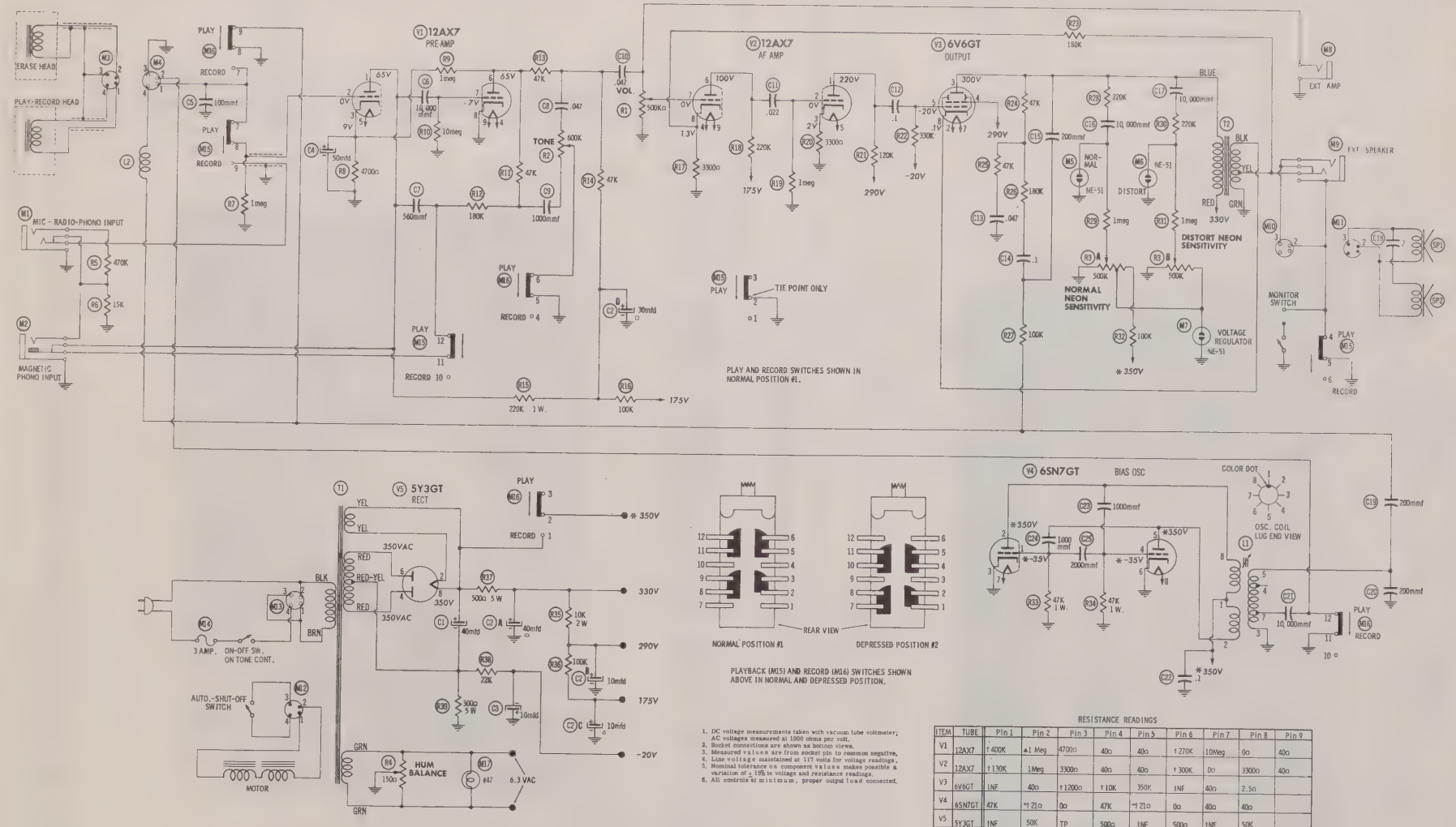
SYMPTOM	CAUSE	REMEDY
	2. Buttons sheered.	2. Replace.
	3. Tabs on interlock bar (87) bent.	3. Straighten or replace. Tab on back of interlock bar must be set so the button lever on the stop button can remove the interlock bar from under the play and record button.
Record Button can be depressed without safety lever.	1. Record interlock return spring off or broken.	1. Replace.
	2. Tabs on record button interlock lever bent or broken.	2. Straighten or replace.
	3. Button sheered.	3. Replace.
Buttons do not stay depressed.	1. Latch bar spring off or broken.	1. Replace.
	2. Latch bar sticking or bent.	2. Repair or replace.
Counter inoperative.	1. Counter belt (142) off pulleys.	1. Replace.
	2. Counter dial loose.	2. Repair or replace.
	3. Gears binding.	3. Counter must turn freely without binding. Check gears and pulleys for binding.
Does not erase clean.	1. Leads off Erase Head (37).	1. Replace.
	2. Erase Head (34) not adjusted properly.	2. Erase Head should be adjusted so the top of the head pole piece is approximately .005 inch above the edge of the tape.
	3. Low erase current.	3. To determine the proper erase current, place a 10 ohm precision resistor in series with either lead leading from the erase head. Place the recorder in the record position and,using an A. C. Voltmeter, check the voltage across the resistor. With the oscillator and erase head functioning properly, the voltage across the resistor should be approximately .3 volts. With a .3 volt reading the required 30 milliamps of current is present.
Pause Brake does not operate properly.	1. Tab on pause brake not adjusted properly.	1. (See "Take-up Reel revolves fast when Play or Record buttons are depressed").
	2. Brake worn.	2. Replace.
	3. Brake return spring off or broken.	3. Replace.



Top View — Model 710 Amplifier



Bottom View — Model 710 Amplifier.



1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AX7	†400K	▲1 Meg	4700Ω	40Ω	40Ω	†270K	10Meg	0Ω	40Ω
V2	12AX7	†130K	1Meg	3300Ω	40Ω	40Ω	†300K	0Ω	3300Ω	40Ω
V3	6V6GT	INF	40Ω	†1200Ω	†10K	350K	INF	40Ω	2.5Ω	
V4	6SN7GT	47K	*†21Ω	0Ω	47K	*†21Ω	0Ω	40Ω	40Ω	
V5	5Y3GT	INF	50K	TP	500Ω	INF	500Ω	INF	50K	

ALL MEASUREMENTS TAKEN IN "PLAY" POSITION UNLESS OTHERWISE NOTED.
*MEASURED IN "RECORD" POSITION.
† MEASURED FROM PIN 8 OF V5.
▲ MEASURED WITH HEAD DISCONNECTED.
TP TIE POINT

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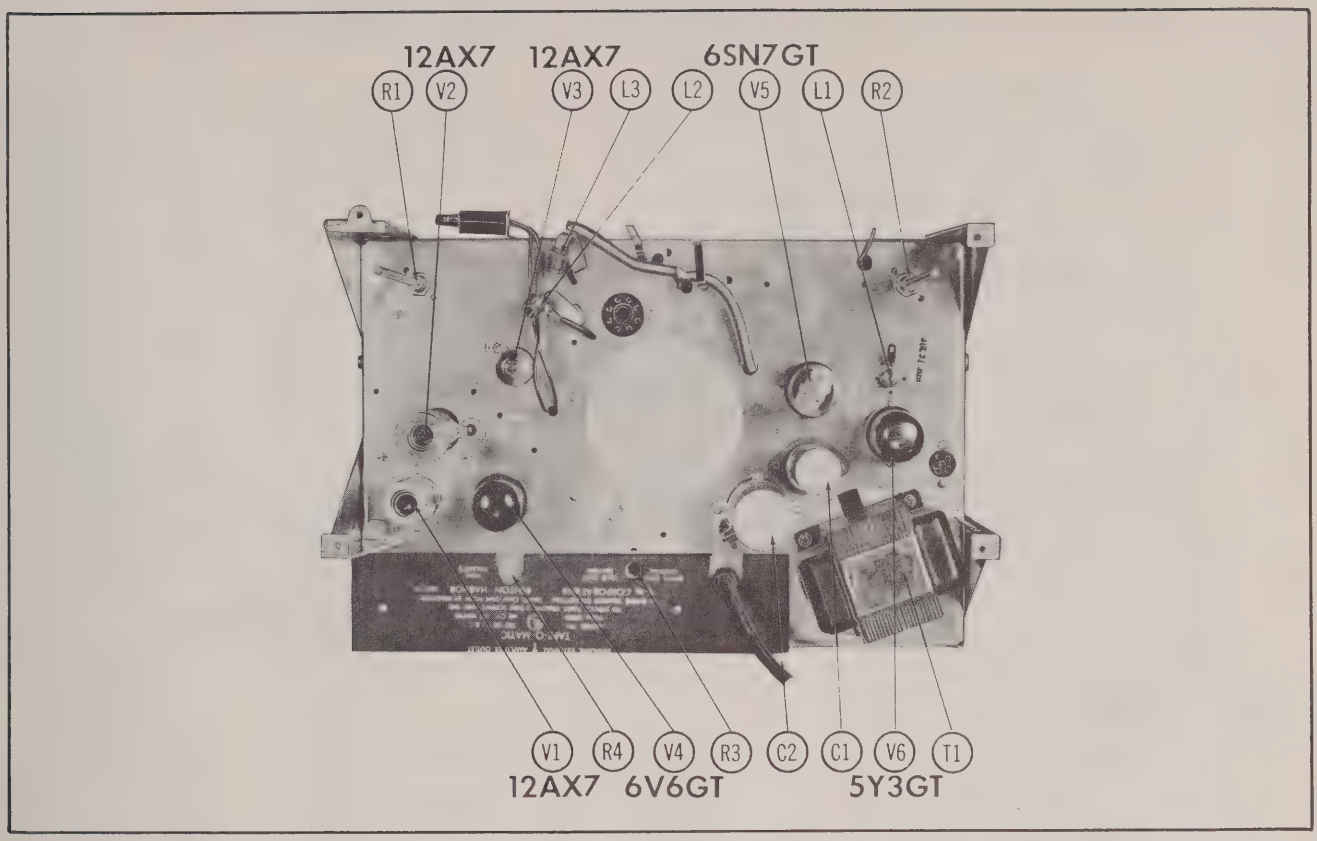
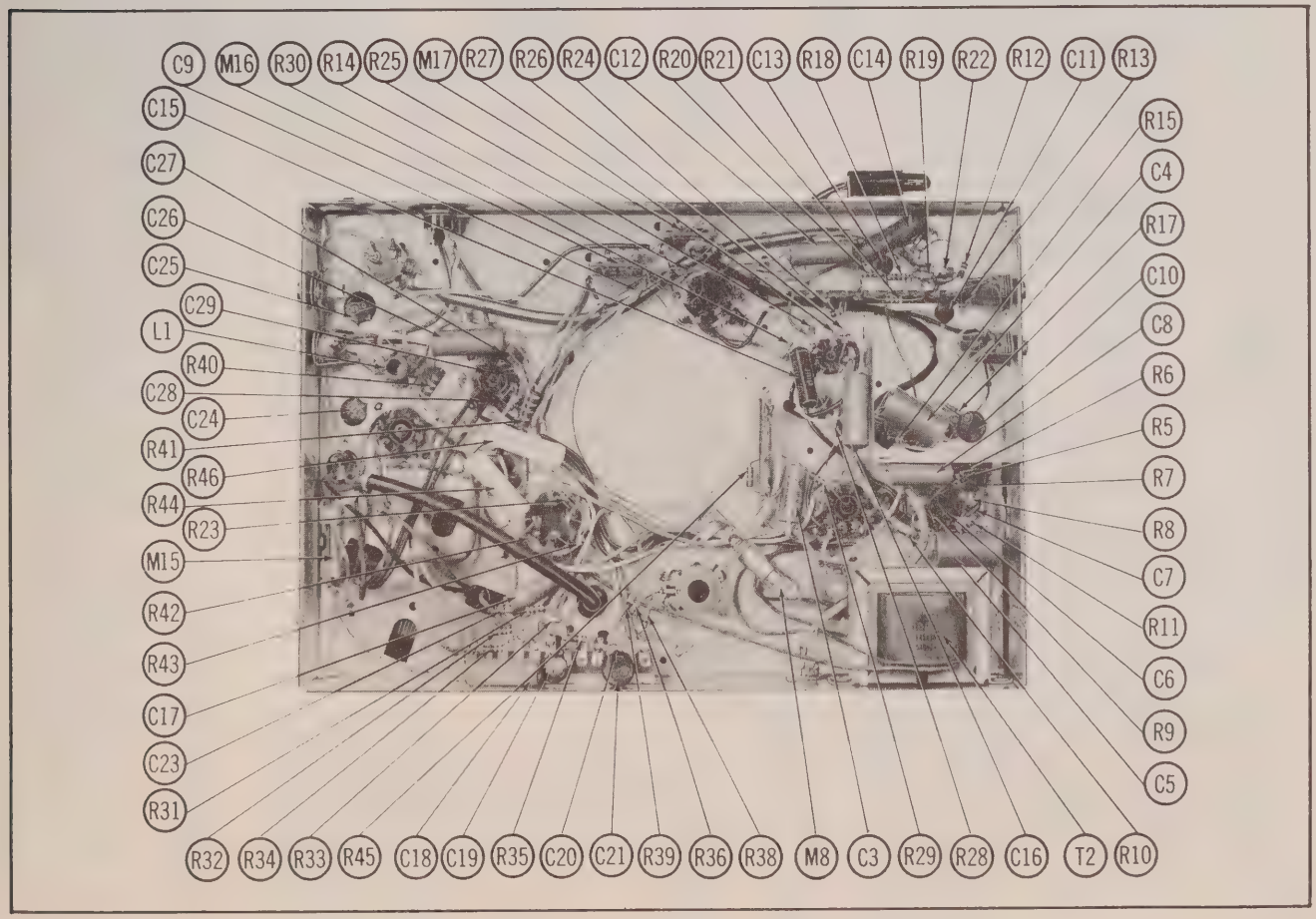
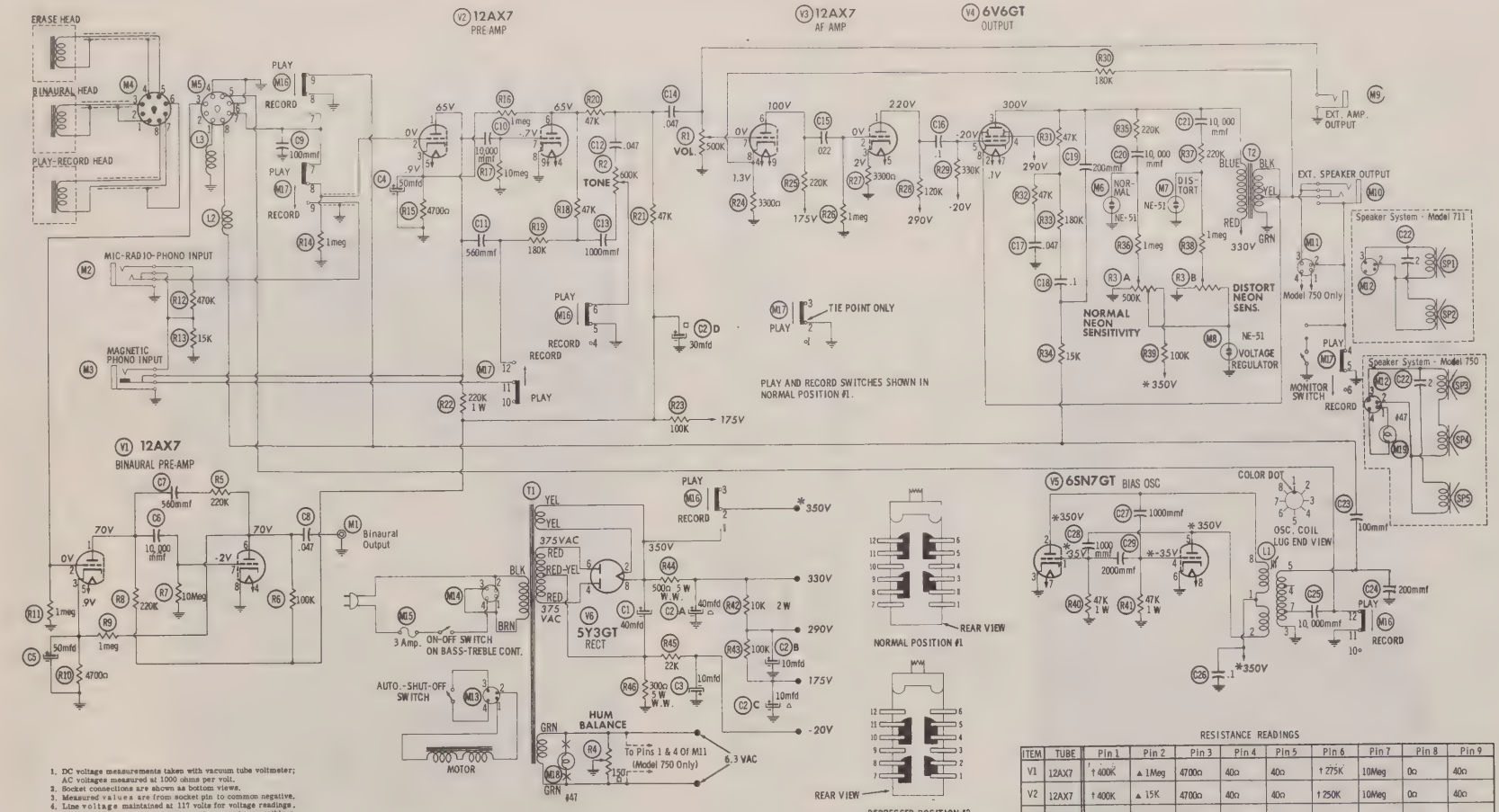
Model 710 Schematic Diagram



Top View — Models 711 & 750 Amplifier.



Bottom View — Models 711 & 750 Amplifier.



1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AX7	†400K	▲1Meg	4700Ω	40Ω	40Ω	†275K	10Meg	0Ω	40Ω
V2	12AX7	†400K	▲15K	4700Ω	40Ω	40Ω	†250K	10Meg	0Ω	40Ω
V3	12AX7	†130K	1Meg	3300Ω	40Ω	40Ω	†300K	0Ω	3300Ω	40Ω
V4	6V6GT	1NF	40Ω	†1200Ω	†10K	350K	1NF	40Ω	2.5Ω	
V5	6SN7GT	47K	†21Ω	0Ω	47K	†21Ω	0Ω	40Ω	40Ω	
V6	5Y3GT	1NF	50K	TP	500Ω	1NF	500Ω	1NF	50K	

ALL MEASUREMENTS TAKEN IN "PLAY" POSITION UNLESS OTHERWISE NOTED.
* MEASURED IN "RECORD" POSITION.
† MEASURED FROM PIN 8 OF V6.
▲ MEASURED WITH HEAD DISCONNECTED.
TP TIE POINT

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Models 711 & 750 Schematic Diagram.

MECHANICAL PARTS LIST (MODELS 710, 711 & 750)

Ref. No.	Part No.	Description
1	8571	Reel Screw (Left Hand)
2	8570	Reel Screw (Right Hand)
3	8356-CX	Reel Disc. Ass'y. (Models 710, and 711)
	8356-AX	Reel Disc. Ass'y. (Model 750)
4	8140	Speed Knob
5	8118-B	Head Escutcheon (Models 710, and 711)
	8118-C	Head Escutcheon (Model 750)
6	8256	Screw, Head Escutcheon Mtg.
7	8649	Knob
8	6990	Felt Washer
9	8407	Screw, #6-32 x 13/16
10	8097	Counter Dial (Small)
11	8122	Counter Dial Springs
12	8096	Counter Dial (Large)
13	S8117-B	Main Escutcheon (Models 710 & 711)
	S8117-C	Main Escutcheon (Model 750)
14	8214	Tri-Mount Stud
15	8607-CX	Cover Plate Ass'y. (Models 710 & 711)
	8361-CR	Cover Plate Ass'y. (Model 750)
16	8296	Screw (#6-32 Self Tap. Shoulder)
17	8138	Spring, Brake Return
18	8297	Brake Arm Ass'y.
19	8567	Rivet
20	S8181	Takeup Arm Ass'y.
21	8441	Spring, Brake Activating
22	8199	Fibre Washer
23	8037	Rivet
24	8293	Safety Switch Release Lever
25	8294	Safety Switch Release Wire
26	8048	Knob, Pause
27	8178	Brake Shoe Ass'y. Pause
28	8017	Spring, Pause Brake Activating
29	4092	Rivet
30	8044	Pause Lever
31	8078	Spring, Capstan Idler Return
32	8152	Screw, Head Bar Adj.
33	8147	Head Bar Bracket
34	8138	Spring, Head Bar Return
35	8520	Spring Washer
36	8593	Head Bar & Plate Ass'y. (Includes Erase Head Bracket, Pressure Roller Stud, Tape Guide & Head Mtg. Screws)
37	12513	Erase Head (Model 710)
	12531	Erase Head (Models 711 & 750)
38	12512	Play-Record Head (Model 710)
	12530	Play-Record Hd. (Models 711 & 750)
39		Binaural Head (Models 711 & 750)
40	2300	#2-56 Hex. Nut, Erase Hd. Adj.
41	8424	Flat Washer
42	2300	#2-56 Hex. Nut, Play-Record Head Adjustment
43	2300	#2-56 Hex. Nut, Binaural Hd. Adj.
44	2300	#2-56 Hex. Nut, Head Nest Mtg.
45	2300	#2-56 Hex. Nut, Play-Record Hd. Azimuth Adj.
46	2300	#2-56 Hex. Nut, Binaural Hd. Azimuth Adj.
47	8131	Spring, Head Adjusting
48	8023	Head Nest
49	8045	Tape Guide
50	8175	#2-56 x 1/8 Phillips R.H.M.S.
51	8489	"E" Ring
52	8266	Fibre Washer
53	8123	Pressure Roller
54	1588	"C" Washer
55	8390	Spring, Pressure Pad
56	8102	Pressure Pad Arm
	8393	Pressure Pad Arm (With Felt Pad)
57	8067	Pressure Pad (Felt)
58	1588	"C" Washer (Models 711 & 750 Only)
59	8390	Spring, Pressure Pad (Models 711 & 750 Only)
60	8102	Pressure Pad Arm (Models 711 & 750 Only)

Ref. No.	Part No.	Description
	8393	Pressure Pad Arm With Felt Pad (Models 711 & 750 Only)
61	8067	Felt Pressure Pad (Models 711 & 750 Only)
62	8048	Monitor Knob
63	2857	Rivets
64	8398	Pal Nut, Timer Mtg.
65	6515	Flat Washer (Reel Height Spacer)
66	1652	"C" Washer
67	2583	Fibre Washer
68	8398	Pal Nut
69	8298	Screw, #6-32 Self Tapping
70	8173	Rewind Actuating Spring
71	S8174	Record Actuating Spring
72	8285	Brake Activating Hook
73	S8174	Play Actuating Spring
74	8173	Forward Actuating Spring
75	8207	Fibre Safety Switch Shield
76	8313	Baseplate Mtg. Screw
77	8050	Tape Guide
78	8434	Head Bar Bracket Spring
79	8031	Dust Shield
80	2274	Fibre Washer
81	8036	Button Housing Ass'y. (Complete) Consists of:
82		8074 Control Button - Rewind, Record, Stop, Play or Fwd.
83		8082 Latch Bar
84		8037 Rivet
85		8432 Interlock Lever
86		8128 Spring
87		8114 Lock Bar
88		8024 Button Lever
89		8256 Screw, #4-38
90		8382 Button Housing & Lever Ass'y., Includes Items 84, 85, 87, and 8022 button housing
91		8089 Rod (Button Lever)
92		1652 "C" Washer
93		1588 "C" Washer
94		8116 Stop Rod
95		8125 Spring
96		8128 Spring
97	8631	Baseplate Ass'y. (Includes all Parts That Are Permanently Fixed)
98	8298	Tape Guide Mtg. Screw
99	8220	Monitor Switch
100	8046	Counter Ass'y. (Complete)
101	S8006	Reel Bearing
102	S8076	Cam Link Spring Guide
103	2857	Rivets
104	8084	Capstan Bearing
105	8098	Bearing Plate
106	8133	Spring Washers
107	1588	"C" Washer
108	8038	Switch Ass'y.
109	8090	Switch Mtg. Bracket
110	8121	Fast Forward Rod
111	8107	Control Rod Guide
112	8326	Takeup Bar Actuator
113	8130	Spring
114	8298	Screw
115	S8377	Takeup Bar Ass'y.
116	8331	Rivet
117	2829	Fibre Washer
118	8488	"E" Washer
119	2829	Fibre Washer
120	8079	Capstan Idler
121	S8391	Capstan Idler Pivot Arm
122	8034	Takeup Belt
123	S8103	Tension Pulley & Bearing
124	8182	R.H. Reel Pulley
125	8568	Cork Washer
126	8488	"E" Ring
127	8014	Bell Crank
128	8009	Brake Rod
129	8037	Rivet
130	8039	Cam & Shaft Ass'y.

MECHANICAL PARTS LIST (Con't.)

Ref. No.	Part No.	Description
131	S8029	Cam Link
132	8535	Cam Link Lift Spring
133	8035	Rewind Rod
134	S8376	Rewind Arm
135	2583	Fibre Washer
136	8566	Cork Washer
137	8018	Takeup Driver
138	8489	"E" Ring
139	8106	Rewind Driver
140	8063	Rewind Belt
141	8183	L.H. Reel Pulley
142	8141	Counter Belt
143	8110	Flywheel & Capstan Ass'y.
144	1652	"C" Washer
145	8373	Washer
146	8060	Rubber Grommet
147	8378	Sub-Plate Ass'y. (Less Grommets & Capstan Bearing)
148	8146	Screw
149	8015	Motor
150	8258	Spring
151	2279	Washer, Metal
152	7470	Washer, Cork
153	8255	Fan
154	1719	"C" Washer

ELECTRICAL PARTS LIST (MODEL 710)

Ref. No.	Part No.	Description
V1	13048	12AX7, Pre-Amplifier
V2	13048	12AX7, AF Amplifier
V3	13054	6V6GT, Audio Output
V4	13155	6SN7GT, Bias Osc.
V5	13061	5Y3GT, Rectifier
C1	12044	Cap., Elect., 40 mfd. @ 450V.
C2A	12045	Cap., Elect., 40 mfd. @ 450V.
C2B		Cap., Elect., 10 mfd. @ 450V.
C2C		Cap., Elect., 10 mfd. @ 450V.
C2D		Cap., Elect., 30 mfd. @ 450V.
C3	12046	Cap., Elect., 10 mfd. @ 25V.
C4	12061	Cap., Elect., 50 mfd. @ 6V.
C5	12048	Cap., Ceramic Tub., 100 mmf. @ 600V.
C6	12062	Cap., Ceramic, 10,000 mmf. @ 600V.
C7	12067-10	Cap., Ceramic, 560 mmf. @ 600V.
C8	12033	Cap., Paper Tub., .047 mfd. @ 400V.
C9	12040-10	Cap., Ceramic, 1000 mmf. @ 600V.
C10	12033	Cap., Paper Tub., .047 mfd. @ 400V.
C11	12037	Cap., Molded Tub., .022 mfd. @ 400V.
C12	12034	Cap., Paper Tub., .1 mfd. @ 400V.
C13	12033	Cap., Paper Tub., .047 mfd. @ 400V.
C14	12034	Cap., Paper Tub., .1 mfd. @ 400V.
C15	12060-10	Cap., Ceramic, 200 mmf. @ 600V.
C16	12062	Cap., Ceramic, 10,000 mmf. @ 600V.
C17	12062	Cap., Ceramic, 10,000 mmf. @ 600V.
C18	12069	Cap., Paper Tub., 2 mfd. @ 100V.
C19	12060-10	Cap., Ceramic, 200 mmf. @ 600V.
C20	12060-10	Cap., Ceramic, 200 mmf. @ 600V.
C21	12062	Cap., Ceramic, 10,000 mmf. @ 600V.
C22	12034	Cap. Paper Tub., .1 mfd. @ 400V.
C23	12040-10	Cap., Ceramic, 1000 mmf. @ 600V.
C24	12040-10	Cap., Ceramic, 1000 mmf. @ 600V.
C25	12068-10	Cap., Ceramic, 2000 mmf. @ 600V.
R1	12308	Volume Control, 500KΩ
R2	12306	Tone Control, On-Off Sw., 600KΩ
R3A	12307	Neon Sensitivity Cont. (Normal), 500KΩ
R3B		Neon Sensitivity Cont. (Distort), 500KΩ
R4	11974	Hum Balance Cont., 150Ω
R5	11373	Resistor, 470KΩ, 1/2 Watt
R6	11013	Resistor, 15KΩ, 1/2 Watt
R7	11453	Resistor, 1 Meg., 1/2 Watt
R8	10893-10	Resistor, 4700Ω, 1/2 Watt
R9	11453	Resistor, 1 Meg., 1/2 Watt
R10	11693	Resistor, 10 Meg., 1/2 Watt
R11	11133-10	Resistor, 47KΩ, 1/2 Watt
R12	11273-10	Resistor, 180K, 1/2 Watt
R13	11133-10	Resistor, 47KΩ, 1/2 Watt
R14	11133-10	Resistor, 47KΩ, 1/2 Watt
R15	11294-10	Resistor, 220KΩ, 1 Watt
R16	11213-10	Resistor, 100KΩ, 1/2 Watt
R17	10853-10	Resistor, 3.3KΩ, 1/2 Watt
R18	11293-10	Resistor, 220KΩ, 1/2 Watt
R19	11453	Resistor, 1 Meg., 1/2 Watt
R20	10853-10	Resistor, 3.3KΩ, 1/2 Watt
R21	11233-10	Resistor, 120KΩ, 1/2 Watt
R22	11333	Resistor, 330KΩ, 1/2 Watt
R23	11273-10	Resistor, 180KΩ, 1/2 Watt
R24	11133-10	Resistor, 47KΩ, 1/2 Watt
R25	11133-10	Resistor, 47KΩ, 1/2 Watt
R26	11273-10	Resistor, 180KΩ, 1/2 Watt
R27	11213-10	Resistor, 100KΩ, 1/2 Watt
R28	11293-10	Resistor, 220KΩ, 1/2 Watt
R29	11453	Resistor, 1 Meg., 1/2 Watt
R30	11293-10	Resistor, 220KΩ, 1/2 Watt
R31	11453	Resistor, 1 Meg., 1/2 Watt
R32	11213-10	Resistor, 100KΩ, 1/2 Watt
R33	11134-10	Resistor, 47KΩ, 1 Watt
R34	11134-10	Resistor, 47KΩ, 1 Watt
R35	10975-10	Resistor, 10KΩ, 2 Watt
R36	11213-10	Resistor, 100KΩ, 1/2 Watt
R37	11963	Resistor, 500Ω, 5 Watt, W.W.
R38	11053	Resistor, 22KΩ, 1/2 Watt
R39	11948	Resistor, 300Ω, 5 Watt, W.W.
T1	12522	Power Transformer
T2	12521	Output Transformer
SP1	8606	Speaker, 6 X 9" — 3.2Ω
SP2	8440	Speaker, 3 1/2" Sq. — 3.2Ω
L1	12529	Bias Osc. Coil
L2	12525	Hum Bucking Coil
M1	8651	Mic. - Radio-Phono Input Jack
M2	8671	Magnetic Phono Input Jack
M3	8206	Head Plug — 4 Prong
M4	8202	Head Socket — 4 Prong
M5	8218	Normal Record Lamp, Neon NE-51
M6	8218	Distort Record Lamp, Neon NE-51
M7	8218	Voltage Regulator, Neon NE-51
M8	5216	External Amplifier Jack
M9	8651	External Speaker Jack
M10	8202	Speaker Socket — 4 Prong
M11	8206	Speaker Plug — 4 Prong
M12	8206	Motor Plug — 4 Prong
M13	8202	Motor Socket — 4 Prong
M14	8232	Fuse — 3 Amp., Type 3AG
M15	8120	Playback Switch Assembly
M16	8119	Record Switch Assembly
M17	4654	Pilot Lamp, #47

ELECTRICAL PARTS LIST (MODELS 711 & 750)

Ref. No.	Part No.	Description
V1	13048	12AX7, Binaural Pre-Amp.
V2	13048	12AX7, Pre-Amplifier
V3	13048	12AX7, AF Amplifier
V4	13054	6V6GT, Audio Output
V5	13155	6SN7GT, Bias Oscillator
V6	13061	5Y3GT, Rectifier
C1	12044	Cap., Elect., 40 mfd. @ 450V.
C2A	12045	Cap., Elect., 40 mfd. @ 450V.
C2B		Cap., Elect., 10 mfd. @ 450V.
C2C		Cap., Elect., 10 mfd @ 450V.
C2D		Cap., Elect., 30 mfd @ 450V.
C3	12046	Cap., Elect., 10 mfd. @ 25V.
C4	12061	Cap., Elect., 50 mfd. @ 6V.
C5	12061	Cap., Elect., 50 mfd. @ 6V.
C6	12062	Cap., Ceramic, 10,000 mmf. @ 600V.
C7	12067-10	Cap., Ceramic, 560 mmf. @ 600V.
C8	12033	Cap., Molded Tub., .047 mfd. @ 400V.
C9	12048	Cap. Ceramic Tub., 100 mmf. @ 600V.
C10	12062	Cap., Ceramic, 10,000 mmf. @ 600V.
C11	12067-10	Cap., Ceramic, 560 mmf. @ 600V.
C12	12033	Cap., Molded Tub., .047 mfd. @ 400V.
C13	12040-10	Cap., Ceramic, 1000 mmf. @600V
C14	12033	Cap., Molded Tub., .047 mfd. @ 400V.
C15	12037	Cap., Molded Tub., .022 mfd. @ 400V.
C16	12034	Cap., Molded Tub., .1 mfd @ 400V.
C17	12033	Cap., Molded Tub., .047 mfd. @ 400V.
C18	12034	Cap., Molded Tub., .1 mfd. @ 400V.
C19	12060-10	Cap., Ceramic, 200 mmf. @ 600V.
C20	12062	Cap., Ceramic, 10,000 mmf. @ 600V.
C21	12062	Cap., Ceramic, 10,000 mmf. @600V.
C22	12069	Cap., Paper Tub., 2 mfd. @100V.
C23	12048	Cap., Ceramic, 100 mmf. @ 600V.
C24	12060-10	Cap., Ceramic, 200 mmf. @ 600V.
C25	12062	Cap., Ceramic, 10,000 mmf. @ 600V.
C26	12034	Cap., Molded Tub., .1 mfd @ 400V.
C27	12040-10	Cap., Ceramic, 1000 mmf @ 600V.
C28	12040-10	Cap., Ceramic, 1000 mmf. @ 600V.
C29	12068-10	Cap., Ceramic, 2000 mmf. @ 600V.
R1	12308	Volume Control, 500KΩ
R2	12306	Tone Control & Switch, 600KΩ
R3A	12307	Neon Sensitivity Cont., (Normal) 500KΩ
R3B		Neon Sensitivity Cont., (Distort) 500KΩ
R4	11974	Hum Balance Cont., 150Ω
R5	11293-10	Resistor, 220KΩ, 1/2 Watt
R6	11213-10	Resistor, 100KΩ, 1/2 Watt
R7	11693	Resistor, 10 Meg., 1/2 Watt
R8	11293-10	Resistor, 220KΩ, 1/2 Watt
R9	11453	Resistor, 1 Meg., 1/2 Watt
R10	10893-10	Resistor, 4700Ω, 1/2 Watt
R11	11453	Resistor, 1 Meg., 1/2 Watt
R12	11373	Resistor, 470KΩ, 1/2 Watt
R13	11013	Resistor, 15KΩ, 1/2 Watt
R14	11453	Resistor, 1 Meg., 1/2 Watt
R15	10893-10	Resistor, 4700Ω, 1/2 Watt
R16	11453	Resistor, 1 Meg., 1/2 Watt
R17	11693	Resistor, 10 Meg., 1/2 Watt
R18	11133-10	Resistor, 47KΩ, 1/2 Watt
R19	11273-10	Resistor, 180KΩ, 1/2 Watt
R20	11133-10	Resistor, 47KΩ, 1/2 Watt
R21	11133-10	Resistor, 47KΩ, 1/2 Watt
R22	11294-10	Resistor, 220KΩ, 1 Watt
R23	11213-10	Resistor, 100KΩ, 1/2 Watt
R24	10853-10	Resistor, 3300Ω, 1/2 Watt
R25	11293-10	Resistor, 220KΩ, 1/2 Watt
R26	11453	Resistor, 1 Meg., 1/2 Watt
R27	10853-10	Resistor, 3300Ω, 1/2 Watt
R28	11233-10	Resistor, 120KΩ, 1/2 Watt
R29	11333	Resistor, 330KΩ, 1/2 Watt
R30	11273-10	Resistor, 180KΩ, 1/2 Watt
R31	11133-10	Resistor, 47KΩ, 1/2 Watt
R32	11133-10	Resistor, 47KΩ, 1/2 Watt
R33	11273-10	Resistor, 180KΩ, 1/2 Watt
R34	11013	Resistor, 15KΩ, 1/2 Watt
R35	11293-10	Resistor, 220KΩ, 1/2 Watt
R36	11453	Resistor, 1 Meg., 1/2 Watt
R37	11293-10	Resistor, 220KΩ, 1/2 Watt
R38	11453	Resistor, 1 Meg., 1/2 Watt
R39	11213-10	Resistor, 100KΩ, 1/2 Watt
R40	11134-10	Resistor, 47KΩ, 1 Watt
R41	11134-10	Resistor, 47KΩ, 1 Watt
R42	10975-10	Resistor, 10KΩ, 2 Watt
R43	11213-10	Resistor, 100KΩ, 1/2 Watt
R44	11963	Resistor, 500Ω, 5 Watt, W.W.
R45	11053	Resistor, 22KΩ, 1/2 Watt
R46	11948	Resistor, 300Ω, 5 Watt, W.W.
T1	12522	Power Transformer
T2	12521	Output Transformer
SP1	8606	Speaker, 6X9" Oval
SP2	8440	Speaker, 3 1/2" Round
SP3	7129	Speaker, 8" Round
SP4	7129	Speaker, 8" Round
SP5	8440	Speaker, 3 1/2" Round
L1	12529	Bias Osc. Coil
L2	12525	Hum Bucking Coil
L3	12525	Hum Bucking Coil
M1	4228	Binaural Output Jack
M2	8651	Mic-Radio-Phono Input
M3	8671	Magnetic Phono Input
M4	8206	Head Plug — 8 Prong
M5	8202	Head Socket — 8 Prong
M6	8218	Normal Record Lamp, Neon NE-51
M7	8218	Distort Record Lamp, Neon NE-51
M8	8218	Voltage Regulator, Neon NE-51
M9	5216	External Amplifier Jack
M10	8651	External Speaker Jack
M11	8202	Speaker Socket — 4 Prong
M12	8206	Speaker Plug — 4 Prong
M13	8206	Motor Plug — 4 Prong
M14	8202	Motor Socket — 4 Prong
M15	8232	Fuse — 3 Amp., Type 3AG
M16	8119	Record Switch Assembly
M17	8120	Play Switch Assembly
M18	4654	Pilot Lamp, #47 (Model 711)
M19	4654	Pilot Lamp, #47 (Model 750)

WELLS-GARDNER MODELS 37A10-551-S, 37A10-562, 237A10-553-S, 237A10-564

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

WELLS-GARDNER MODELS 37A10-551-S, 37A10-562, 237A10-553-S, 237A10-564

WELLS-GARDNER MODELS 37A10-551-S, 37A10-562, 237A10-553-S, 237A10-564

TRADE NAME	Wells-Gardner Models 37A10-551-S, 37A10-562, 237A10-553-S, 237A10-564
SUPPLIER	Wells-Gardner & Co., 2701 N. Kildare Ave., Chicago 39, Ill.
TYPE SET	AC Operated AM Receiver With Automatic Record Changer
TUBES (Eight)	Types: 6BA6 RF Amp., 6BE6 Converter, 6BA6 IF Amp., 6AV6 Det.-AVC-AF Amp., 12AX7 AF Amp.-Phase Inv., (2) 6AQ5 Output, 5Y3GT Rectifier
POWER SUPPLY	105-120 Volts AC-60 Cycles RATING .56 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST	540KC-1600KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Loop should be maintained in same relative position to chassis as when receiver is in cabinet.
To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to pin 7 (grid) of 6BE6 (V2). Low side to chassis.	455KC (400∿Mod)	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output.
2.	"	"	1620KC	"	"	A5	"
3.	"	High side to pin 1 (grid) of 6BA6 (V1). Low side to chassis.	1400KC	Tune to 1400KC signal	"	A6	"
4.		Loop	"	"	"	A7	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.

FOR SERVICE INFORMATION ON 3 SPEED AUTOMATIC RECORD CHANGER - SEE SIMILAR V-M MODEL 954B - PHOTOFACT SET 302 - FOLDER 12.
FOR SERVICE INFORMATION ON 4 SPEED AUTOMATIC RECORD CHANGER - SEE SIMILAR V-M MODEL 1200 - PHOTOFACT SET 290- FOLDER 11 OR RECORD CHANGER MANUAL CM-7.

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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PARTS LIST AND DESCRIPTIONS

WELLS-GARDNER
MODEL 37A10-551-S

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA		RETMA BASE TYPE	NOTES
		Wells-Gardner PART No.	STANDARD REPLACEMENT		
V1	RF Amplifier	6BA6	6BA6	7BK	
V2	Converter	6BE6	6BE6	7CH	
V3	IF Amplifier	6BA6	6BA6	7BK	
V4	Det.-AVC-AF Amp.	6AV6	6AV6	7BT	
V5	AF Amplifier-Phase Inverter	12AX7	12AX7	9A	
V6	Audio Output	6AQ5	6AQ5	7BZ	
V7	Audio Output	6AQ5	6AQ5	7BZ	
V8	Rectifier	5Y3GT	5Y3GT	5T	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	Wells-Gardner PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲40	350	45X415	AFH3-43	C0340	FP376.8	TMT-38	T-165	TVL-3785
B	■40	350							
C	▲10	350							
C2	5	10	45X426 (Note 1)			TC22 * TC22	TD-5-10NP	MTD-0210 †	

Note 1. Item C2 is a non-polarized unit.
* Connect negative leads together.
† Use positive leads only.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	Wells-Gardner PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C3	.01	200		BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C4	.047	200	RCP10W4473M	BPD-05	DF-503	CUB2S47		PT4147	2TM-S47	
C5	.022	400	RCP10W4223M	BPD-02	DF-203	CUB4S22	817-02	PT4122	4TM-S22	
C6	470		47X622	SI470	D6-471	TP46	GP2K-471	UC-5347	5GA-T47	
C7	33		47X612	N750-SI33	TCN-33	TN10	N750K-330		5TCU-Q33	
C8	.047	400	RCP10W4473M	BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C9	.047	400	RCP10W4473M	BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C10A	50	}	♦76X1	♦PA-99	♦PC-52	♦1111TM3	♦1403-03	{ UC-545	} ♦D-3	
B	50	}						UC-545		
C11	470		47X622	SI470	D6-471	TP46	GP2K-471	UC-5347	5GA-T47	
C12	22		47X627	SI22	D6-220	TP22	GP1K-220	UC-5422	5GA-Q22	
C13	.047	200	RCP10W2473M	BPD-05	DF-503	CUB2S47		PT4147	2TM-S47	
C14	.0047	600	RCP10W2472M	SI4700	D6-472	CUB6D47	GP2-333-472	PT6247	6TM-D47	
C15	180	500	45X564	NP0-SI180	TCZ-180	5R5T18	NP0-334-181		MS-318	
C16	.022	400	RCP10W4223M	BPD-02	DF-203	CUB4S22	817-02	PT4122	4TM-S22	
C17	330		47X624	SI330	D6-331	TP43	GP2K-331	UC-5333	5GA-T33	
C18	.0047	600	RCP10W2472M	SI4700	D6-472	CUB6D47	GP2-333-472	PT6247	6TM-D47	
C19	.0047	600	RCP10W2472M	SI4700	D6-472	CUB6D47	GP2-333-472	PT6247	6TM-D47	
C20	1500			SI1500	D6-152	TP54	GP2L-152	UC-5215	5HK-D15	
C21	.022	400	RCP10W4223M	BPD-02	DF-203	CUB4S22	817-02	PT4122	4TM-S22	
C22	.022	400	RCP10W4223M	BPD-02	DF-203	CUB4S22	817-02	PT4122	4TM-S22	
C23	.0022	1000	RCP10M10222M	HVD-15-2200	DD-202	CUB16D22	IR5KV-222	PT16222	10TM-D22	
C24	.0022	1000	RCP10M10222M	HVD-15-2200	DD-202	CUB16D22	IR5KV-222	PT16222	10TM-D22	

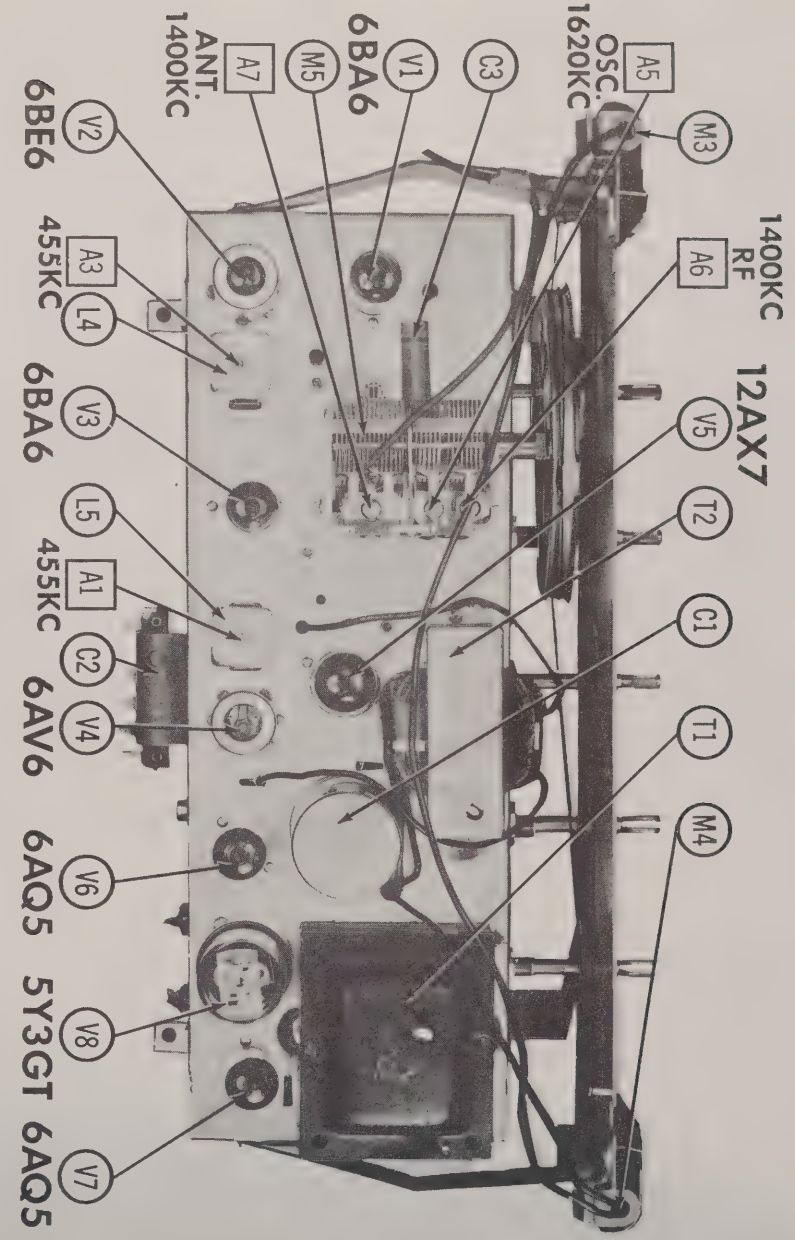
♦ Items C10A, C10B and R15 are combined in one unit.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	Wells-Gardner PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	1Meg	½	40X403	AB-70	A47-1Meg-Z	Q13-137	U-53	Bass - Note 1
B	Shaft		Not Req.	AK-4	KSS-3	Note Req.	Not Req.	Attach to R1A
R2A	500KΩ	½	40X404	AB-60	A47-500K-Z	Q13-133	U-48	Treble
B	Shaft		Not Req.	AK-4	KSS-3	Not Req.	Not Req.	Attach to R2A
C	Switch		Not Req.	KB-1	SWE-12	76-1	US-26	Attach to R2A
R3A	2Meg	½	36X392	ABT-79	A47F6-2Meg	Q13-139X	UT-449	Loudness tap @ 500KΩ
B	Shaft		Not Req.	AK-4	KSS-4	Not Req.	Not Req.	Attach to R3A

Note 1. Model 37A10-551-S, 237A10-553-S use 200K in this application (Part #40X411).

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA Wells-Gardner PART No.	REPLACEMENT DATA IRC PART No.	NOTES
R4	3.3Meg	½		BTS-3.3Meg	
R5	47KΩ	½		BTS-47K	
R6	330KΩ	½		BTS-330K	
R7	100KΩ	½		BTS-100K	
R8	100Ω	½		BTS-100	
R9	47Ω	½		BTS-47	
R10	39KΩ	½		BTS-39K	
R11	33KΩ	1		BTA-33K	
R12	2.2Meg	½		BTS-2.2Meg	
R13	33KΩ	1		BTA-33K	
R14	330Ω	½		BTS-330	
R15	47KΩ	½	♦76X1	BTS-47K	
R16	100KΩ	½		BTS-100K	
R17	68KΩ	½	B84683	BTS-68K	
R18	10Meg	½		BTS-10Meg	
R19	270KΩ	½		BTS-270K	
R20	2.2Meg	½		BTS-2.2Meg	
R21	470KΩ	½		BTS-470K	
R22	33KΩ	½		BTS-33K	
R23	180KΩ	½		BTS-180K	
R24	100KΩ	½		BTS-100K	
R25	2200Ω	½		BTS-2200	
R26	470Ω	½		BTS-470	
R27	120KΩ	½		BTS-120K	
R28	100KΩ	½		BTS-100K	
R29	120KΩ	½		BTS-120K	
R30	470Ω	½		BTS-470	
R31	220KΩ 5%	½		BTS-220K 5%	
R32	7500Ω 5%	½	B83752	BTS-7500 5%	
R33	220KΩ	½		BTS-220K	
R34	220Ω	2			
R35	1000Ω	1		BTA-1000	
R36	6800Ω	½		BTS-6800	

♦ Items C10A, C10B, R15 are combined in one unit.

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	RATING SEC. 3	REPLACEMENT DATA Wells-Gardner PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC @.56A	506VCT .078ADC	5VAC @ 2A	6.3VAC @2.74A	53X353	P9205①②	P-3051 ①	PM8403 ①②		R-8B①②

① Drill new mounting holes.
② Tape 6.3V center tap.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA Wells-Gardner PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	6.3KΩ CT	7Ω	51X171A	Z1013	A-2905	A-3880	22S58①	S-57Z ①	① Drill one new mounting hole.

SPEAKER

ITEM No.	RATINGS SIZE	RATINGS FIELD	RATINGS V. C. IMP.	REPLACEMENT DATA Wells-Gardner PART No.	REPLACEMENT DATA QUAM PART No.	NOTES
SP1	5"	PM	15Ω	J-12A530-O	5A15T	
SP2	15"	PM	7Ω	J-12A529-A	15A10WF	

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA Wells-Gardner PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	Loop Ant.	1.2Ω		9A2376				
L2	RF Coil	10.2Ω		9A2289				Tap @6.2Ω
L3	Osc. Coil	.6Ω	6Ω	9A2113	14-1060	BC-387	71-OSC	
L4	Input IF	13Ω	15Ω	9A2112	16-6758	BC-352	12-C1	
L5	Output IF	14Ω	15Ω	9A2063	16-6758	BC-353	12-C2	

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA Wells-Gardner PART No.	ASTATIC PART No. CARTRIDGE	ASTATIC PART No. NEEDLE	ELECTRO-VOICE PART No. CARTRIDGE	ELECTRO-VOICE PART No. NEEDLES	REMARKS
M1		55-T	GD-J	47	0-1 or S-1 & 0-3	

ASTATIC AND ELECTRO-VOICE NEEDLE LISTINGS SHOWN ABOVE ARE SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGES LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENT SEE BELOW.

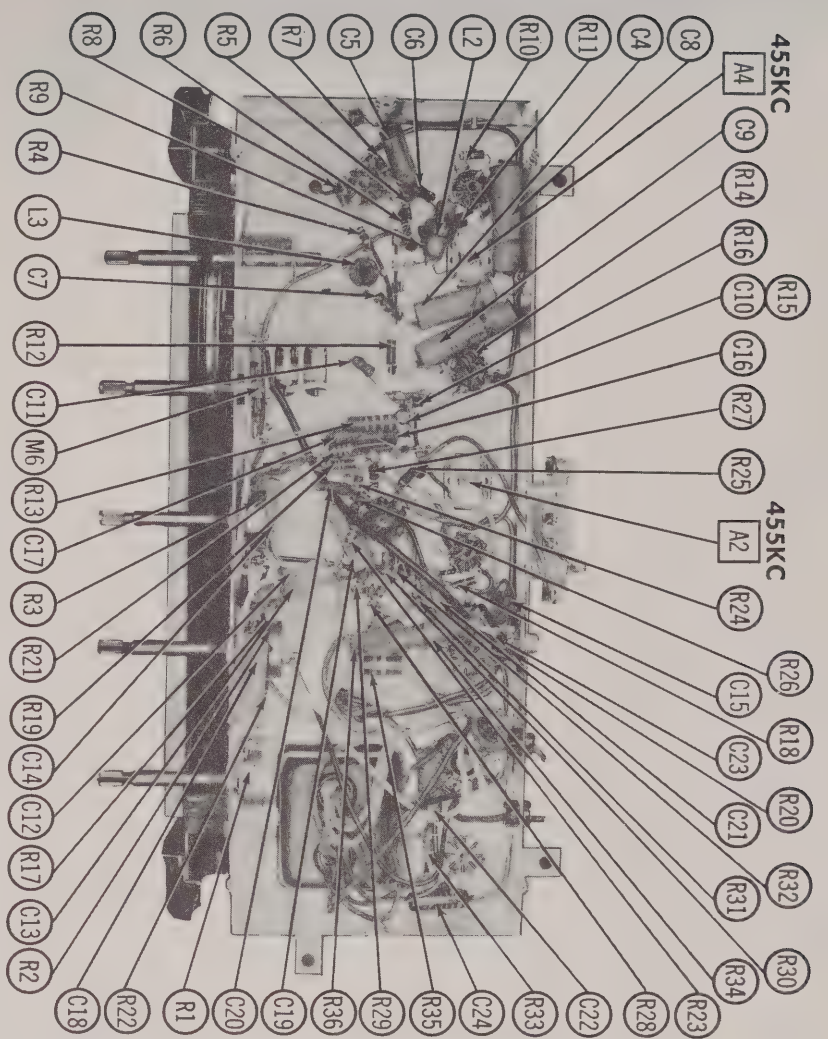
PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA Wells-Gardner PART No.	JENSEN PART No.	WALCO PART No.	REMARKS
M2		*S-67 or †S-66 or †♦S-66SD or ♦S-66D	†W-75TPS or †♦W-75DS or ♦W-75TPD	* Metal † Jewel ♦ Diamond

SET 349 FOLDER 14

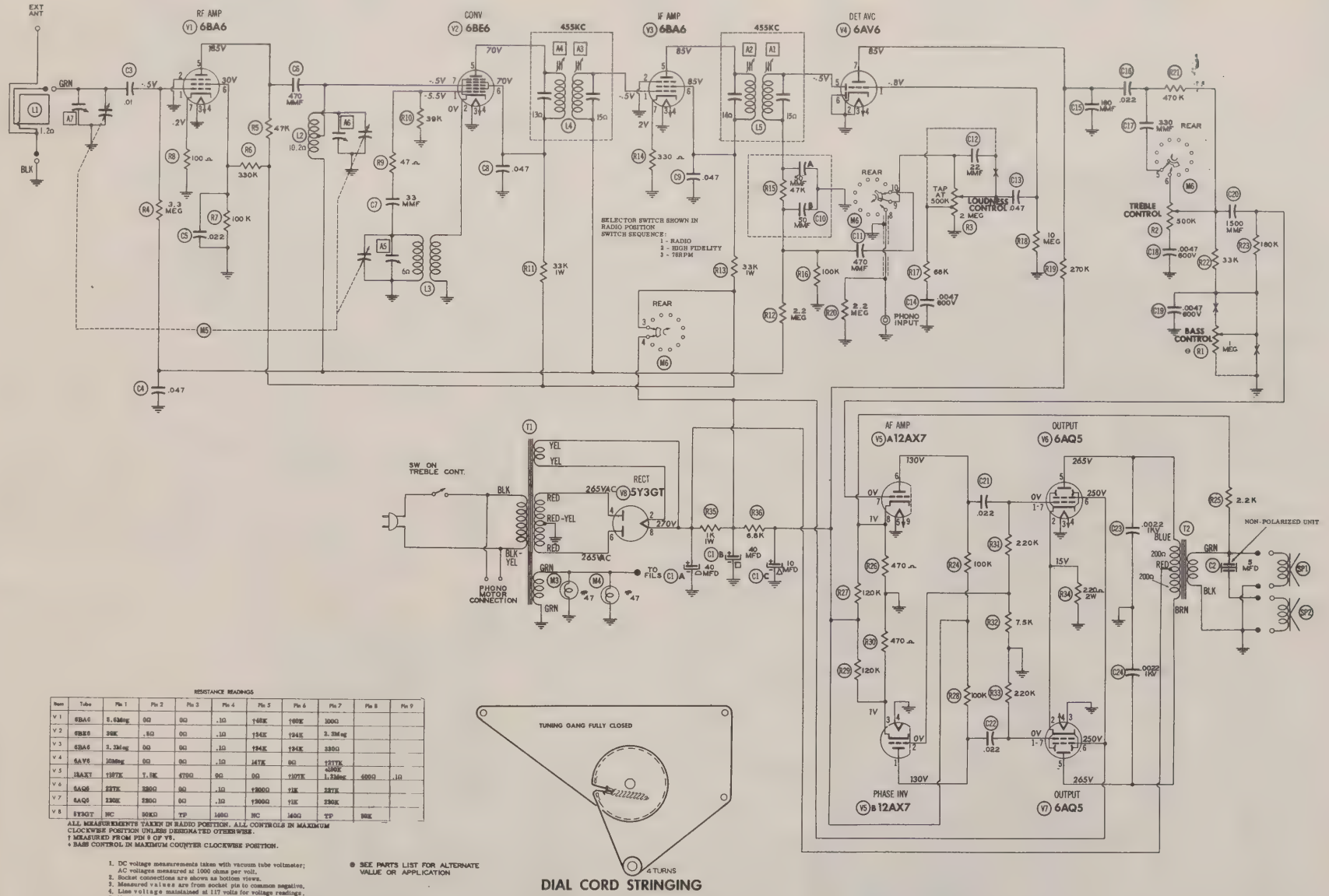
CHASSIS—BOTTOM VIEW



MISCELLANEOUS

ITEM No.	PART NAME	Wells-Gardner PART No.	NOTES
M3	Dial Light		#47
M4	Dial Light		#47
M5	Tuning Cap.	14A226	3 Gang (17-495MMF, 13-245MMF, 13-105MMF)
M6	Switch	2A460	Radio-Phono (Rotary-wafer type)
	Knob	10A866-1	Tuning - Mahogany cabinets
	Knob	10A867-1	Radio-Phono switch, on-off-volume, tone - Mahogany cabinets
	Knob	10A866-2	Tuning - Oak cabinets
	Knob	10A867-2	Radio-Phono switch, on-off-volume, tone - Oak cabinets
	Dial Glass	58X792	
	Dial Pointer	15X278-2	

WELLS-GARDNER MODEL 37A10-551-S



DIAL CORD STRINGING

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BA6	5.6Meg	0Ω	0Ω	.1Ω	†68K	†68K	100Ω		
V 2	6BE6	39K	.5Ω	0Ω	.1Ω	†34K	†34K	2.2Meg		
V 3	6BA6	2.2Meg	0Ω	0Ω	.1Ω	†34K	†34K	330Ω		
V 4	6AV6	10Meg	0Ω	0Ω	.1Ω	147K	0Ω	†217K		
V 5	12AX7	†97K	7.8K	470Ω	0Ω	0Ω	†107K	470K* 1.2Meg	600Ω	.1Ω
V 6	6AQ5	227K	230Ω	0Ω	.1Ω	†300Ω	†1K	227K		
V 7	6AQ5	230K	230Ω	0Ω	.1Ω	†300Ω	†1K	230K		
V 8	5Y3GT	NC	50KΩ	TP	140Ω	NC	140Ω	TP	90K	

ALL MEASUREMENTS TAKEN IN RADIO POSITION. ALL CONTROLS IN MAXIMUM CLOCKWISE POSITION UNLESS DESIGNATED OTHERWISE.
† MEASURED FROM PIN 8 OF V8.
* BASS CONTROL IN MAXIMUM COUNTER CLOCKWISE POSITION.

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

● SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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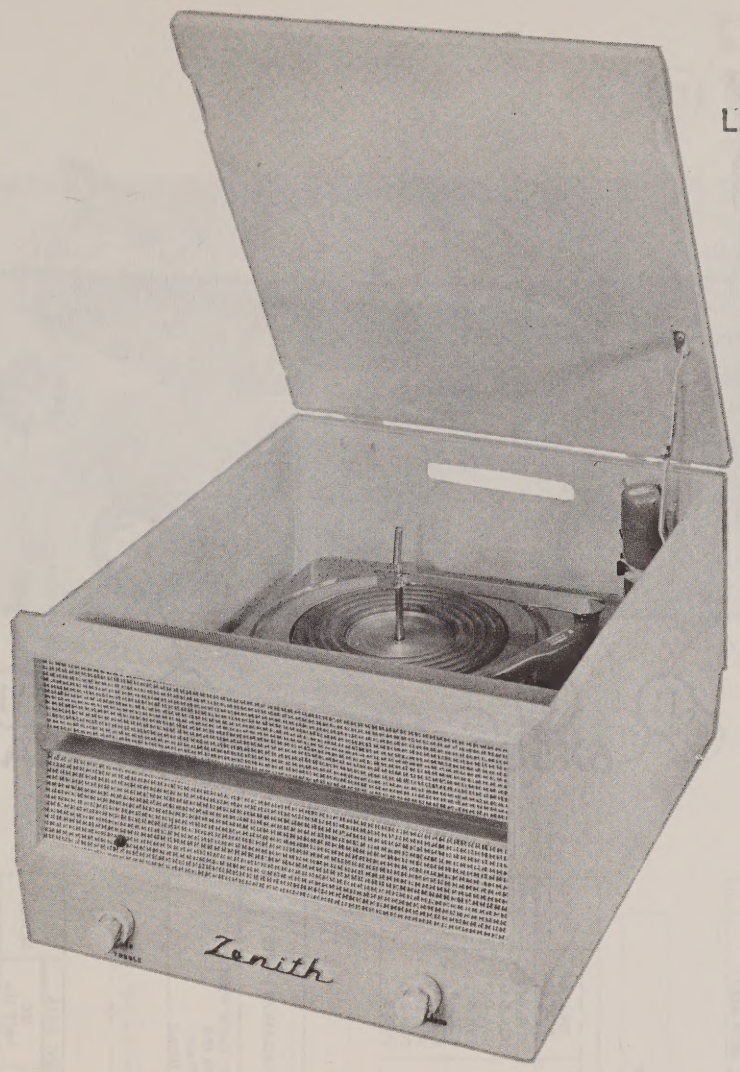
ZENITH
MODELS HFY15E, R (Ch. 3Y05)

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE St.
DENVER, COLORADO

ZENITH
MODELS HFY15E, R (Ch. 3Y05)



ZENITH
MODELS HFY15E, R (Ch. 3Y05)

TRADE NAME	Zenith Models HFY15E, HFY15R (Ch. 3Y05)
MANUFACTURER	Zenith Radio Corp., 6001 Dickens Ave., Chicago 39, Ill.
TYPE SET	AC Operated Phono Amplifier With 4 Speed Automatic Record Changer
TUBES (Three)	Types 12AX7 AF Amplifier, 6V6GT Output, 6X5GT Rectifier
POWER SUPPLY	110-120 Volts AC - 60 Cycles RATING .35 Amp. @ 117 Volts AC

RECORD CHANGE UNIT - ZENITH MODEL S-14067

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

"The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed." "Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. Copyright 1957 by Howard W. Sams & Co., Inc., Indianapolis 5, Indiana, U. S. of America. Copyright under international Copyright Union. All rights reserved under Inter-American Copyright Union (1910) by Howard W. Sams & Co., Inc." Printed in U. S. of America

PARTS LIST AND DESCRIPTIONS

ZENITH
MODEL HFY15E (Ch. 3Y05)

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	AF Amplifier	12AX7	
V2	Output	6V6GT	

ITEM No.	USE	TYPE	NOTES
V3	Rectifier	6X5GT	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA ZENITH PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	■80	350	22-2872	AFH2-45-10		FP227.4	TMD-36	S-220	TVL-2633
B	▲20	350					TD-50-450	MTD-4530	

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA ZENITH PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C2	.047	600		BPD-05	DF-503	CUB6S47		PT6147	6TM-S47	
C3	2200		22-18	DI-0022	D6-222	K073	811-0022	UC-5222	5GA-D22	
C4	4700		22-4	DI-0047	DD-472	K079	811-0047	UC-5247	5GA-D47	
C5	10000		22-3	BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C6	.01	600	22-2815	BPD-01	D6-103	CUB6S1	GP3-333-103	PT611	6TM-S1	
C7	.047	400		BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C8	3300		22-2670	BPD-0033	D6-332	K077	811-0033	UC-5233	5GA-D33	
C9	2200		22-18	DI-0022	D6-222	K073	811-0022	UC-5222	5GA-D22	
C10	10000		22-3	BPD-01	DD-103	K082	811-01	DC511	5HK-S1	

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA ZENITH PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1Meg	1/2	63-3649	ABT-74	A47F5-1Meg	Q19-137X	UT-443	Volume, Tap@ 800K
B	Shaft			AK-4	KSS-3	Not Req.	Not Req.	Attach to R1A
R2A	1.5Meg	1/2	63-3648				UF-155R	Bass (Panel)
B	250K	1/2					UR-354A	Treble (Rear)

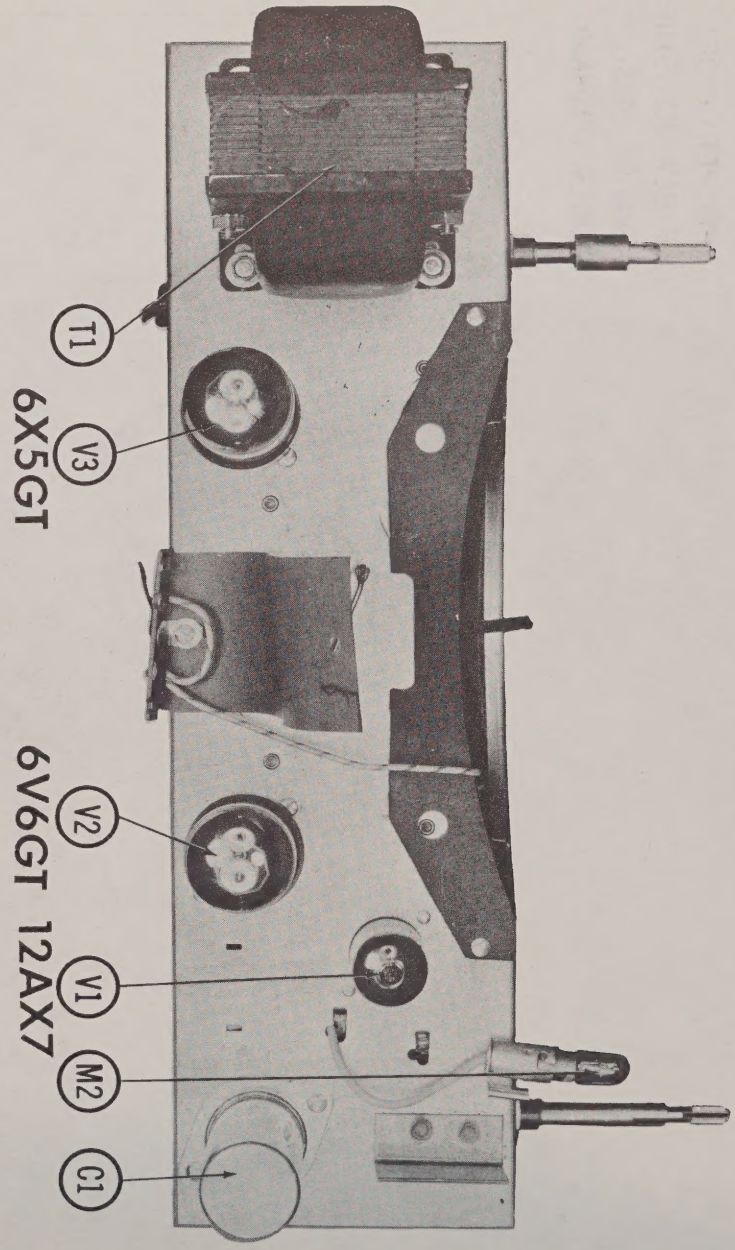
RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA ZENITH PART No.	IRC PART No.	NOTES
R3	5.6Meg		63-1943	BTS-5.6Meg	
R4	220K		63-1883	BTS-220K	
R5	3900Ω		63-1810	BTS-3900	
R6	100K		63-1869	BTS-100K	
R7	220K		63-1883	BTS-220K	
R8	100K		63-1869	BTS-100K	
R9	3900Ω		63-1810	BTS-3900	
R10	220K		63-1883	BTS-220K	

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA ZENITH PART No.	IRC PART No.	NOTES
R11	1500Ω		63-1792	BTS-1500	
R12	470K		63-1898	BTS-470K	
R13	4700Ω		63-1813	BTS-4700	
R14	220Ω	1	63-3206	BTA-220	
R15	2200Ω		63-1799	BTS-2200	
R16	47Ω		63-1729	BTS-47	
R17	47Ω		63-1729	BTS-47	
R18	5600Ω	1	63-3207	BTA-5600	

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	ZENITH PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC @ .35A	515VCT @ .057A	6.3VAC @ 1.3A		95-1392	P9204②	P-3148①	PC-8420①	26R31U	R-10A①②

① Drill new mounting holes.
② Tape 5V winding.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	ZENITH PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	7000Ω	3-4Ω	95-1488	Z1011	A-2902①	A-3824	22S58	S-9X	① Drill one new mtg. hole.

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	ZENITH PART No.	QUAM PART No.	
SP1 SP2 SP3	8"	PM	3-4Ω	49-758 S-23829 ① S-23829 ①	8A21	① Electrostatic Speakers.

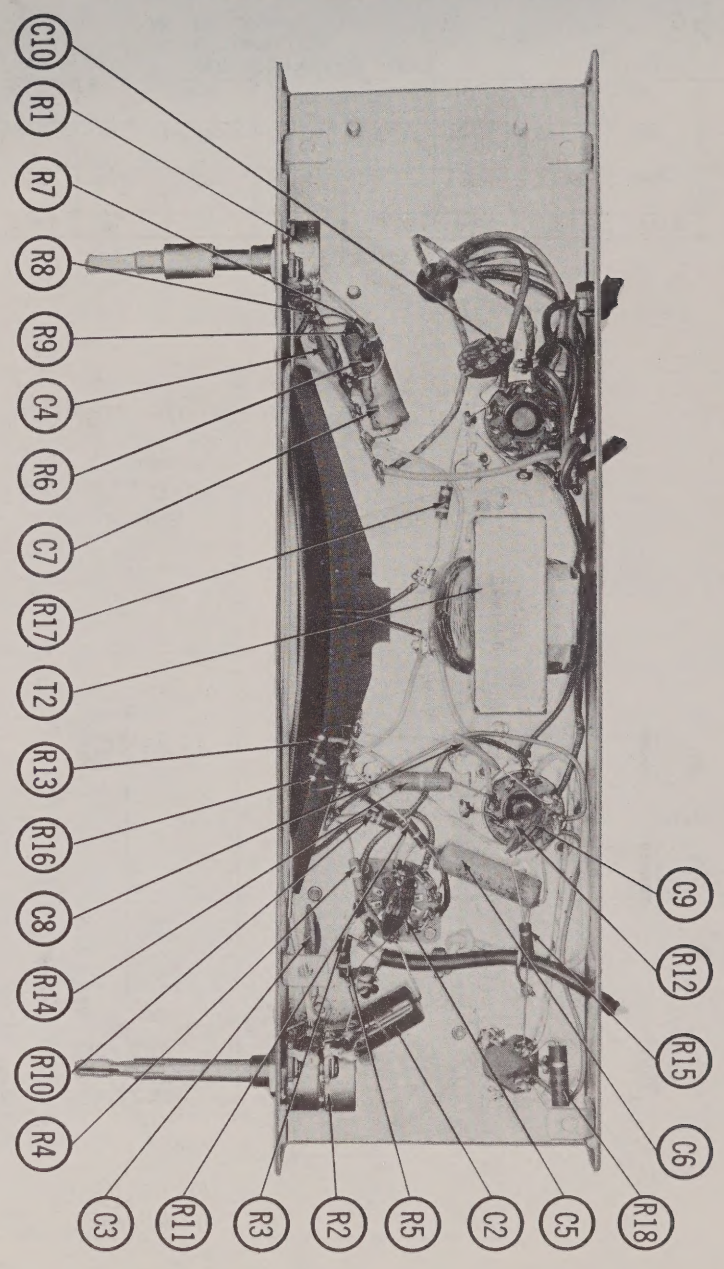
PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA					REMARKS
	ZENITH PART No.	ASTATIC PART No.		ELECTRO-VOICE PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M1	142-77					

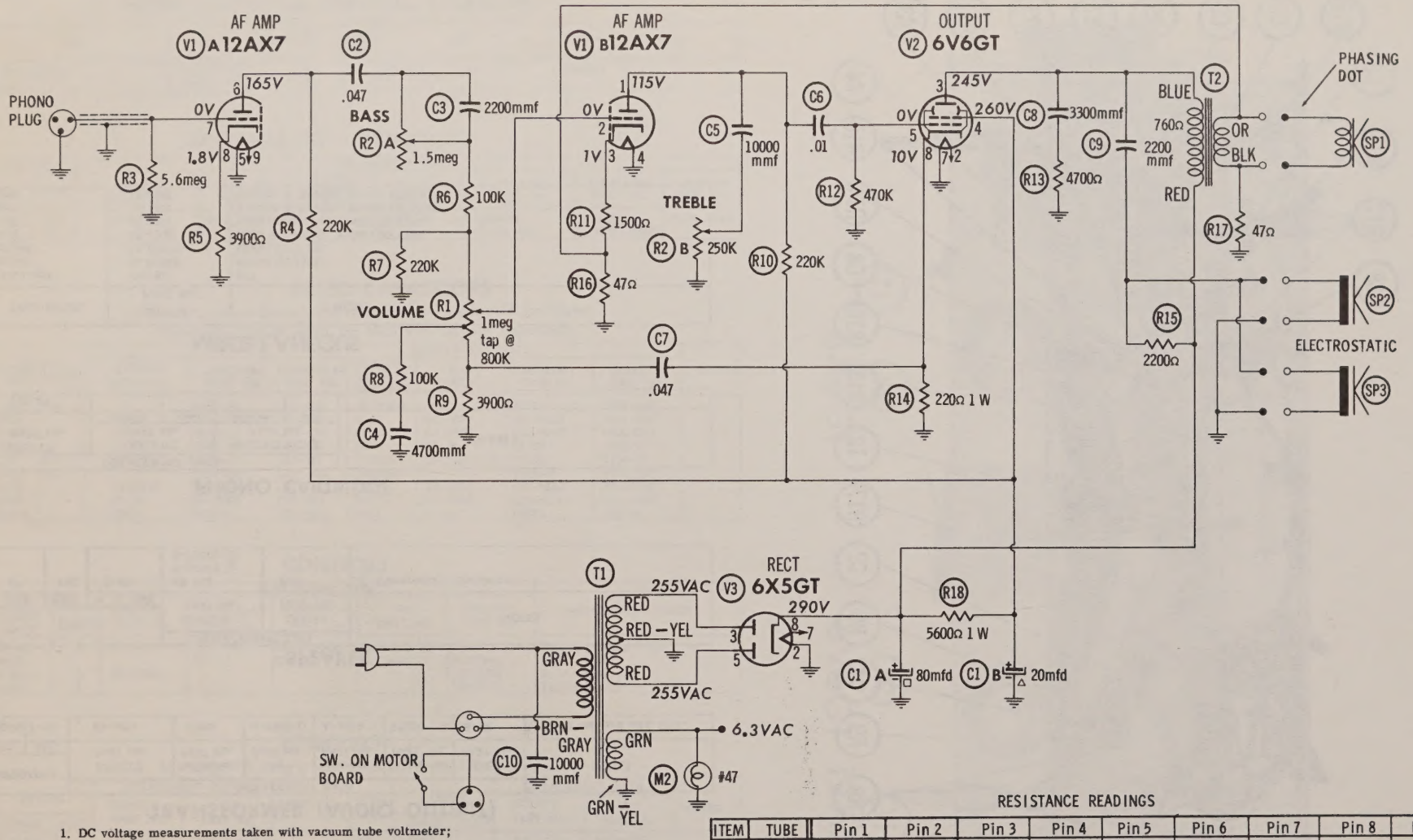
MISCELLANEOUS

ITEM No.	PART NAME	ZENITH PART No.	NOTES
M2	Pilot Light	100-67	#47
	Cabinet	14-1979E	Model HFY15E
	Cabinet	14-1979R	Model HFY15R.
	Knob	46-1300	Bass & Dummy, Model HFY15R.
	Knob	46-1301	Bass & Dummy, Model HFY15E.
	Knob	46-1317	Volume & Treble, Model HFY15R.
	Knob	46-1318	Volume & Treble, Model HFY15E.

CHASSIS—BOTTOM VIEW



ZENITH
MODEL HFY15E (Ch. 3Y05)



1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AX7	†225K	3900Ω	1500Ω	0Ω	0Ω	†225K	5.6Meg	3900Ω	.2Ω
V2	6V6GT	NC	.2Ω	†760Ω	†5600Ω	470K	TP	0Ω	220Ω	
V3	6X5GT	NC	0Ω	140Ω	TP	155Ω	TP	.2Ω	45K	

† MEASURED FROM PIN 8 OF V3.
NC NO CONNECTION
TP TIE POINT

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